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DIRECTOR OF SHIP MATERIAL TECHNICAL INSPECTION REPORT

Classification (Cancelled) ~~to~~ to **UNCLASSIFIED**

By Authority of Memo. Ch. Sec. Dir. 14/57

By John J. Johnson Date 3/2/65

Radiological Decontamination of Target and Non-Target Vessels

Best Available Copy VOLUME 3 OF 3

OPERATION CROSSROADS

JOINT TASK FORCE ONE

DDC

NOV 19 1965

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DIRECTOR OF SHIP MATERIAL

TECHNICAL REPORT

⑥ **OPERATION CROSSROADS.**
RADIOLOGICAL DECONTAMINATION
OF
TARGET AND NON-TARGET VESSELS. (Upper Case)
VOLUME 3.

⑨ *Director of Ship Material Technical*
Inspection Rpt.,
⑪ 1946,
⑫ 126p.

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⑭ XRD-187

Fdc

⑩ J.J. Fee.
~~Commander, USN.~~

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APPENDIX IV
DECONTAMINATION AND SHIP CLEARANCE
DIRECTIVES

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RESTRICTED DATA
ATOMIC ENERGY ACT 1946

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014/TAS/jjm
Serial: 462

DIRECTOR OF SHIP MATERIAL
JOINT TASK FORCE ONE

31 July 1946.

DIRECTOR OF SHIP MATERIAL MEMORANDUM #13.

To: All Target Vessels.

Subj: Decontamination Procedures on Target Vessels.

1. Most target vessels are contaminated to a greater or less degree with fission products and therefore present varying degrees of radiological hazards which at the present time prevent reboarding. Decontamination procedures are being carried out at the present time in order to make it possible for portions of the crews of these vessels to return aboard to complete the decontamination procedures. It is expected to bring the radiological hazards now existing in general on the topside of these vessels to a point where it will be possible for personnel to be aboard for a period of at least four (4) hours at one time. Commanding Officers should therefore, organize boarding parties on this basis and in consideration of the conditions and procedures contained in this memorandum.

2. Fission products are sub-microscopic particles and therefore not visible to the eye and their presence can only be determined by the use of monitoring instruments. These products are extremely difficult to remove in as much as they are quite firmly imbedded in the paintwork, metallic structures, wooden decks and particularly in such absorbent materials as lines, clothing, bunting, etc. Great care must also be taken in all decontamination procedures to prevent personnel engaged in these operations from becoming contaminated themselves.

3. The following procedures will assist in re-establishing normal conditions. It is expected that procedures will have to be repeated a number of times in order to get effective results.

(a) Washing down entire ships including topside structures, decks, sides and all exposed gear. It has not been possible up to the

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D 32602

present time to determine how much contamination exists below decks and these conditions must be determined as soon as boarding parties arrive.

(b) In order to carry out (a) above it will be necessary to gain access to certain below decks spaces to establish power, either by installed generators, ship's boilers, or by portable pumps available for this purpose. Access to the necessary spaces must be monitored carefully. It is hoped that because of the steps taken to close all openings below decks that below deck spaces will be relatively free of radiological hazards. However, attention is invited to the fact that hazards existing on one side of a deck or bulkhead also presents a hazard on the other side. For instance, it is quite certain that hulls of ships below the water line generally will be highly radioactive at this time and therefore it is desirable for all personnel to keep at a distance of at least two (2) feet from these portions of the hull except for short periods necessary to do essential work such as opening and closing valves, etc.

(c) The object of (a) above is to remove as much as possible of the less firmly attached fission products. Subsequently, it will be necessary to follow more drastic procedures in order to remove the remaining products; generally speaking, it will be necessary to remove by polishing, vigorous scrubbing, holystoning, or other means; at least a portion of all surfaces and carefully washing down all removed material and insure that it is washed overboard. At the present time, the Director of Ship Material is conducting experiments with foamite lye, flour slurrys, and other absorbent materials in the hope that some material available on the ships can be used to hasten the processes of decontamination. Damage to paint and appearance by using these methods are of no consequence.

4. The following precautions should be taken by all personnel in these operations in order to prevent possible exposure to radiological hazards.

(a) Monitors must be present at all times during these operations.

(b) Do not remain on the ship beyond the tolerance hours set.

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(c) All personnel to be fully clothed at all times and to have a complete change of clothing and effective showers after each operation in which they are engaged. In this connection it is desirable to wear rubbers or boots and acid-resistant gauntlet type rubber gloves as these materials can be cleaned more easily. For instance, the fission products attach themselves more readily to leather, leather shoes, and leather gloves and are most difficult to remove even by laundering. All clothing worn must be laundered after each operation. All contaminated clothing should, wherever possible, be carefully washed out separate and apart from the ship's regular laundry. For small amounts buckets and tubs can be utilized. Where the lots are so large as to make use of the ship's regular laundry facilities mandatory, the inside of the equipment should afterwards be thoroughly scurbbbed with an abrasive soap, such as Bon-Ami.

(d) During any hosing or washing down operations, personnel should be to windward of all such operations in order to prevent spraying and wetting themselves and any other personnel on board. Great care must be exercised in this respect, particularly until the ship begins to reach normal conditions.

(e) Upper vertical surfaces will present the greatest difficulties in decontamination and work on these surfaces must be controlled so as to prevent any spray or drippings falling on other personnel.

(f) Access passages to the most used and most necessary spaces in the ship should be decontaminated as soon as possible, in other words, set up definite routes of access which must be used by all personnel until general clearance is obtained.

(g) Determine as soon as practicable what space below decks are free from contamination or relatively free from contamination and require personnel to remain in these spaces at such times as they are resting or eating.

(h) It will be necessary to use K-rations at least in the beginning and these should be brought daily rather than in large supplies, and a space free from contamination used for keeping them until meal hour. Fresh water in canteens must be brought each day and handled in the same way.

(i) Determine as soon as practicable the condition of consumable supplies which may have been left on board and also condition of stored fresh water. Samples of suspected or definitely contaminated materials should be brought to the U. S. S. HAVEN properly tagged

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and identified for further examination. It is desirable that the fresh water from all storage tanks be so tested before using.

(j) All radiological dangers, when found, shall be marked clearly and if necessary roped off to keep personnel at a safe distance.

5. It is expected that the decontamination procedures on all ships will be rather slow and certainly laborious. Only by careful attention to the above instructions can effective results be obtained in the least amount of time. The Director of Ship Material group and the Radiological Safety Section will cooperate so as to insure that no personnel are subjected to any over-exposure or other hazards. Monitors will be used until the entire ship has been decontaminated, inspected, and declared to be within safe tolerance limits for all personnel to reboard on a twenty-four (24) hour basis.

6. The above instructions have been approved by the Radiological Safety Section.

T. A. SOLBERG.

cc:

CJTF-1
CTG 1.2
CTU 1.2.7
Colonel Warren
File

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SECRET JOINT TASK FORCE ONE
 DIRECTOR OF SHIP MATERIAL
 TARGET PREPARATION AND INSPECTION OFFICE

014K1/EJH/naa/S88

4 August 1946.

DIRECTOR OF SHIP MATERIAL MEMORANDUM No. :

From: Director of Ship Material.
To : CTU 1.2.7
 TU 1.2.7
 All DSM Initial Boarding Teams
 All Target Vessels.

Subject: Preliminary Decontamination of Target Vessels by Ships
 of TU 1.2.7.

Ref: (a) DSM Memorandum No. 13 of 31 July 1946.

Encl: (A) Instructions for mixing and applying Paint Removal
 Mixture.

1. Reference (a) outlined the procedures to be followed by the ship's force in rehabilitating the various contaminated target vessels, once a tolerable level of radioactivity obtains. Many of the target vessels at present have such radioactive contamination that the ship's forces can not work aboard a sufficient length of time to safely and effectively use the procedures given in reference (a). Therefore, it will be necessary to take preliminary steps to clear the vessels sufficiently to permit the ship's force to pick up the ball. This preliminary decontamination procedure should reduce the radiation intensities to permit at least four hours' working time for the ship's force over substantial areas of the topsides of the target vessels.

2. The preliminary decontamination procedure that shows promise of accomplishing the desired results is best accomplished by vessels of TU 1.2.7. The steps that comprise this procedure are as follows:

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(a) A through wash down with plain water. This removes some of the likelihood of contamination of boarding personnel.

(b) The radiological monitor, DSM representative, and ship's force representative will then make a quick preliminary survey of the target vessel noting general average Roentgen readings and also any hot spots which may be present. Together with the Commanding Officer of the salvage vessel, a plan of action will be laid out prior to going to work on the ship which in some cases would use up tolerance time needlessly.

(c) If conditions permit, the ship's force working party will then board the target vessel and remove all life rafts, canvas not protecting an interior space, exposed manila, fire hose, and the like for which no suitable decontamination procedure has been devised and which have been found to be uniformly hot. The working party will be worked in relays to avoid over exposure and will be returned to the hotel transport upon completion. When the target ship is too hot to permit this to be done at this time, the operation will be accomplished after (f) below.

(d) After removal of canvas, life rafts, etc., the target vessel is sprayed with the paint removal mixture in accordance with enclosure (A).

(e) After an interval of approximately two hours the ship is again hosed down. This wash down is for the purpose of removing paint. The maximum force of the fire monitors must be applied to all painted surfaces to accomplish this end. All decks and platforms should be swept with the hose upon completion to remove all paint chips possible from the ship. This washing should proceed from the top of the target vessel downward to avoid recontaminating an area that has been cleaned below. Where contaminated paint chips are washed down on a wood deck they should be frequently swept clear (by the fire monitors) to avoid transferring contamination to the wood. Care should be taken to avoid holidays in the removal job as it is more effective to do a comparatively small part of the ship thoroughly than the whole ship in a haphazard manner. When the paint removal mixture has been properly applied, at least the top coat of paint should be removed by this washing, and the radioactivity level substantially reduced.

(f) The target vessel should then be reboarded by the DSM representative with a monitor and a responsible officer from the target vessel. The general radiation level will be checked at this boarding to ascertain whether or not the vessel is suitable for application

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of decontamination methods outlined in reference (a). All hot spots should be noted and the source of the excessive radiation determined if practicable. If the hot spot is extensive and apparently due to holidays in removal of paint from large surfaces it may be necessary to repeat the applicable steps in the procedure to clear up the hot spot.

3. When the first preliminary survey of radiological conditions is made, consideration must be given to the length of time a salvage or fire fighting vessel can lay alongside without exceeding the tolerance. Step (e) in the procedure will require the longest time interval estimated at about four hours per destroyer and a correspondingly longer time for larger vessels. It is very desirable to actually put a line over to the target vessel to permit laying alongside and performing an effective job of washing down. Care should be exercised in all washing down to avoid washing contaminated materials into the target vessels or upon the salvage vessel concerned. In some cases danger exists of introducing large amounts of water into the ships. It may be necessary to skip certain areas of the ship, such as around open hatches on APA's, large air intakes on all vessels which are not fitted with suitable closures, etc.

4. During the entire decontamination a representative of the Director of Ship Material and an officer representative of the target vessel being worked on will be present. Radiological safety monitors are aboard all TU 1.2.7 vessels which are assigned to this work. The duties of these officers will be to see that the provisions of this memorandum are safely and effectively carried out. They will maintain liaison with the DSM organization and the commanding officer of the target vessel, make such reports and recommendations as are normally made by Initial Boarding Teams and, as circumstances warrant, arrange for working parties from the target vessel, etc.

5. Many of the life rafts, some of the canvas and other materials removed in step (c) above will be required if the target ship is to return under her own power to the port designated for ultimate disposition. The life rafts should be secured close aboard astern of the target ships. Contaminated fire hose, manila and essential canvas may be loaded into them. Somewhat limited ex-

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perience would indicate that this may be a satisfactory decontamination procedure for these materials. Care must be exercised in handling these highly radioactive materials to avoid insofar as practicable, contamination of the clothes and persons of the working party.

T. A. SOLBERG,
Rear Admiral, U.S. Navy.

Copy to:

CJTF-1
CTG 1.2
CTG 1.3
CTG 1.8

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Enclosure (A) To DSM Memorandum No. ____.

Subject: Instructions for Mixing and Applying the Paint Removal Mixture.

1. All vessels which are to be assigned to apply the Paint Removal Mixture have been fitted with tanks of about 1000 gallon capacity for preparing and holding the Paint Removal Mixture. This mixture will be applied by using a Chrysler salvage pump taking suction from the tank and supplying a 1 1/2" hose at suitable pressure to reach the surface it is desired to coat. The 1 1/2" hose may be fitted with an all purpose nozzle or a long handled applicator with a modified fog nozzle attachment as appropriate for the work to be accomplished. All painted surfaces of the target vessel should be thoroughly coated, although it is undesirable to apply so much that pools of the mixture form on the deck or pour out of the scuppers, inasmuch as the supply of materials in the area is limited and effort is expended in mixing wasted material. The maneuvering of the salvage or fire-fighting vessel and the pressure on the pump should be varied as circumstances warrant to secure complete coverage of all the painted surfaces and to reduce the wastage to a minimum. It will probably be found desirable and necessary to make several passes at the ship to be sprayed in order to obtain the desired results with the least exposure.

2. The Paint Removal Mixture is composed of lye, boiler compound and cornstarch. The amounts required for 1000 gallons of mixture are 450 lbs. of lye, 600 lbs. of boiler compound and 75 lbs of cornstarch. About 500 gallons of fresh water should be put in the tank and the lye and boiler compound added gradually and thoroughly mixed and dissolved. The cornstarch should be made into a thin suspension separately in buckets or G.I. cans and added gradually with continuous stirring to obtain a final mixture free of lumps. Fresh water to make 1000 gallons should be added at this time. The whole batch should then be heated by a steam hose until the starch swells and the boiler compound completely dissolves. The mixture will now have the consistency of a thin paste. It will be uniform and capable of

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being applied in the manner outlined. If a ready source of steam is not available for cooking the formula, the cornstarch will have to be cooked separately in a galley kettle until thickened and then added and stirred into the mixture until it has a uniform consistency.

3. In mixing and supplying the Paint Removal Mixture it must be borne in mind that the lye mixture will produce painful burns if splashed on the skin. If it gets into the eyes, it may be dangerous as well as painful. Therefore, it will be necessary to take due precautions to prevent injuries by wearing of suitable protective clothing by necessary personnel. All unnecessary men should be kept clear of the areas where the mixture is being handled. Suitable first aid materials such as boric acid ointment and eyewash should be broken out and the pharmacist's mate should be alerted to take care of any minor casualties should they occur.

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C O N F I D E N T I A L

FROM: CINCPAC

TO: ALPAC 238

4 SEPT 46

INFO: CNO

BUSHIPS

COM 11/COMWESSEAFRON

COM 12/CJTF-1

COMDR ALL NAV TG JTF-1

COM 13/ COM 14

032333Z

NCR 9560

ALL VESSELS AND SMALL BOATS INCLUDING SMALL LANDING CRAFT WHICH HAVE BEEN EXPOSED TO RADIOLOGICAL CONTAM-

INATION AS A RESULT OF CROSSROADS WILL BE TREATED AS FOLLOWS UNTIL DEFINITELY PROVEN SAFE BY MONITOR GROUPS

TO BE ESTABLISHED AT SAN FRANCISCO, KWAJALEIN, GUAM AND UNTIL DETAILED INSTRUCTIONS ARE PROMULGATED BY CJTF-1.

(A) VESSELS SHALL NOT BE DRYDOCKED.

(B) WORK WILL NOT BE UNDERTAKEN WHICH INVOLVED EXPOSURE OF PERSONNEL

TO FUMES DUE TO WELDING OR CUTTING, OR TO DUST, IF ORIGINATED FROM SURFACES CONTAMINATED BY SEA WATER.

(C) BOATS DECLARED RADIOLOGICALLY SAFE WILL BE SUNK IN DEEP WATER NOT BURNED.

(D) BOATS DECLARED RADIOLOGICALLY SAFE WILL BE RETAINED AND TREATED AS NORMAL BOATS.

SINKING OF CONTAMINATED BOATS AT KWAJALEIN AUTHORIZED. CNOB GUAM AUTHORIZED TO DESIGNATE SUITABLE REPRESENT-

ATIVE KWAJALEIN TO INSURE COMPLIANCE

SECRET

CANO 302200 NOT TO ALL

CJTF-1 ...COG

20F...OP03(33)...20K...BUSHIPS...BA7...414...OP04...20P...ALPAC.

032333Z/238

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NOTE: THIS DIRECTIVE PARTIALLY SUPERSEDED CJTF1 SERIAL 079 OF 9 SEPTEMBER 1946. (SEE APPENDIX II)

<u>BUSHIPS Code 180</u>	NAVY DEPARTMENT	
All/Crossroads/FS/L9	BUREAU OF SHIPS	<u>BUMED</u>
All/Crossroads (P2)	and	A4-1/FS
Serial 1381	BUREAU OF MEDICINE AND SURGERY	
	WASHINGTON 25, D. C.	

CONFIDENTIAL
AIRMAIL

SPEEDLETTER

24 SEPTEMBER 1946

TO: CINCPAC
COMWESSEAFRON
COMSERVPAC
COMTWELVE
COM19THFLT

SUBJECT IS RADIOLOGICAL CLEARANCE OF NON TARGET VESSELS AND PROCEDURES FOR DECONTAMINATION X BUSHIPS HAS BEEN ASSIGNED COGNIZANCE OF DECONTAMINATION PROCEDURES PLUS SAFE OPERATING AND MAINTENANCE METHODS IN CASES OF ALL VESSELS EXPOSED TO RADIOACTIVITY X BUMED ASSIGNED RESPONSIBILITY FOR DETERMINING SAFE RADIOLOGICAL LIMITS X THESE BUREAUS WILL ACT JOINTLY IN GIVING FINAL RADIOLOGICAL CLEARANCE TO VESSELS AFTER REVIEWING REMAINING IN ACTIVE SERVICE X REFERENCE COMJOINT TASK FORCE ONE SERIAL ZERO SEVEN NINE OF NINE SEPTEMBER X WHERE INFORMATION AND INSTRUCTIONS THIS SPEEDLETTER CONFLICT WITH REFERENCE THIS SPEEDLETTER WILL APPLY X

ABLE X EVAPORATORS X OPEN SUMP OR OTHER CLEAN OUT DOORS AND REMOVE ALL LOOSE SCALE UNDER WET CONDITIONS X COLLECT ALL SCALE CAREFULLY IN CLOSED CONTAINERS AND SEGREGATE UNTIL DISPOSAL AT SEA IS PRACTICABLE X SUBSEQUENTLY CARRY OUT ONE ACID CLEANING PROCESS X USE TWO PARTS EIGHTEEN DEGREE BAUME COMMERCIAL MURIATIC ACID WITH FIFTEEN PARTS FRESH WATER X FILL EVAPORATORS WITH THIS SOLUTION TO TOP OF TUBE NESTS X CIRCULATE MIXTURE THROUGH SHELLS AND EVAPORATOR FEED HEATERS

SECRET

FOR TWO HOURS BEGINNING WITH TIME SOLUTION IS STARTED INTO SHELLS X REMOVE SOLUTION AND FLUSH THOROUGHLY X OBSERVE USUAL PRECAUTIONS HANDLING ACIDS X DO NOT REPEAT NOT HEAT SOLUTION X THE ABOVE PROCEDURE APPLIES TO ALL TYPES OF EVAPORATORS EXCEPT BADGER TYPES HAVE DOUBLE ABLE AND TRIPLE ABLE TYPES HEAT EXCHANGERS X FOR THESE UNITS BOIL OUT FOR NINE SIX HOURS AT TEMPERATURE OF TWO HUNDRED FAHRENHEIT USING ONE POUND BOILER COMPOUND TO TEN GALLONS FRESH WATER X USED ACID MIXTURE TO BE COLLECTED AND DISPOSED OF AT SEA X NO REPEAT NO ADDITIONAL ACID CLEANINGS ARE NECESSARY AND EVAPORATORS SUBSEQUENTLY ARE TO BE OPERATED AND MAINTAINED IN ROUTINE MANNER X

BAKER X LUBRICATING OIL COOLERS AND OTHER HEAT TRANSFER APPARATUS (EXCEPT CONDENSERS) USING SALT WATER FOR COOLING X IF MONITORS HAVE SHOWN EXISTENCE OF ANY MEASURABLE RADIATION USE ONE ACID TREATMENT FOR SALT WATER SIDE AS IN ABLE ABOVE EXCEPT USE ACID IN ONE HALF OF THE PROPORTION SPECIFIED X SUBSEQUENT OPERATION AND MAINTENANCE WILL BE REQUIRED X VESSELS OF TASK UNIT 1.2.7 (SALVAGE UNIT) GENERALLY HAD CONTAMINATED COOLERS BECAUSE OF THEIR EXTENSIVE EMPLOYMENT IN RADIOACTIVE WATERS X CHARLIE X DESIRE ABLE AND BAKER CARRIED OUT AS SOON AS PRACTICABLE: PREFERABLY BY SHIPS FORCE X BUT NOT REPEAT NOT TO INTERFERE WITH SCHEDULED OPERATIONS X

DOG X DOCKING X ALL VESSELS CAN BE DOCKED WHEN DESIRED X FOLLOWING PROCEDURE APPLIES FIRST DOCKING ONLY AFTER LEAVING BIKINI LAGOON X MARINE GROWTHS TO BE REMOVED BY SCRAPERS AS DOCK IS PUMPED DOWN X PUMPING RATE TO BE ADJUSTED SO THAT MARINE GROWTH IS KEPT WET X COLLECT ALL MARINE GROWTH PRACTICABLE FROM DOCK, KEEP IT WET AT ALL TIMES AND DUMP AT SEA BEYOND ONE HUNDRED FATHOM LINE OR AT LEAST TEN MILES AT SEA X

EASY X SANDBLASTING AND PAINTING UNDERWATER BODY X CARRY OUT REGULAR WET SANDBLASTING PROCEDURE INSURING WET CONDITIONS X KEEP DOCK FLOOR WET DURING OPERATION X COLLECT ALL OF SAND PRACTICABLE MAINTAINING

WET CONDITION UNTIL DUMPED AT SEA AS IN DOG ABOVE X

FOX X DESIRE DOG AND EASY ABOVE CARRIED OUT AT FIRST SCHEDULED DOCKING OF VESSELS INVOLVED X

GEORGE X MONITORS ARE DESIRABLE BUT NOT REPEAT NOT ESSENTIAL FOR ABOVE OPERATIONS IF CARRIED OUT AS DIRECTED HEREIN X MONITORS SHOULD BE REQUESTED FROM RADIOLOGICAL SAFETY OFFICER TWELFTH NAVAL DISTRICT AND WILL BE FURNISHED IF PRACTICABLE X

HOW X SALT WATER LINES X TESTS HAVE DEMONSTRATED THAT ALL ROUTINE REPAIRS INVOLVING CUTTING AND WELDING CAN BE PERFORMED BY SHIPS AND YARDS WITH NO REPEAT NO DANGERS BEING INVOLVED X HOWEVER IN ALL CASES WHERE A SECTION OF LINE IS RENEWED THE OLD SECTION SHALL BE RETAINED, SEGREGATED AND DUMPED AT SEA X ANY FOULING REMOVED FROM SALT WATER LINES SHOULD BE HANDLED AND DISPOSED OF AS IN ABLE ABOVE X

ITEM X MAIN AND AUXILIARY CONDENSERS X RENEW ALL ZINCS, SEGREGATE AND DISPOSE OF AT SEA X TO BE DONE AS SOON AS PRACTICABLE BY SHIPS FORCE X

JIG X SHIPS BOATS X ANY BOATS NOT REPEAT NOT ALREADY DISPOSED OF WILL BE RETAINED AND TREATED AS FOLLOWS X SCRUB ENTIRE HULL THOROUGHLY WITH STRONG MIXTURE OF LYE AND BOILER COMPOUND X USE LONG HANDLED SCRUBBERS AND REMOVE AS MUCH OF PAINT AS PRACTICABLE IN THIS OPERATION X SUBSEQUENTLY REPAINT WITH FOUR COATS OF PAINT X RUDDERS AND SCREWS ALSO SHOULD BE SCRUBBED WITH ABOVE MIXTURE X IF MONITORS HAVE REPORTED ANY ACTIVITY IN ENGINES OR COOLERS CIRCULATE ACID MIXTURE AS IN BAKER ABOVE X EXHAUST PIPE TAILS SIMILARLY REPORTED ACTIVE SHOULD BE RENEWED AND DUMPED AT SEA X FENDERS AND CANVAS REPORTED ACTIVE SHOULD BE RENEWED AND SUNK AT SEA X TO BE DONE AS SOON AS PRACTICABLE BY SHIPS FORCE X

KING X STRUCTURAL REPAIRS ON THESE VESSELS ARE NOT INVOLVED AND CAN BE PERFORMED WITH NO RESTRICTIONS X

SECRET

LOVE X BUSHIPS WILL ISSUE ANY FURTHER INSTRUCTIONS OR
MODIFICATIONS REQUIRED X MAKE REPORTS ON ITEMS ABOVE
WHEN ACCOMPLISHED TO BUSHIPS AND BUMED AND TO RADIO
LOGICAL SAFETY OFFICER COMTWELVE X NOTE THAT IN EACH
CASE ABLE THROUGH JIG THE SPECIFIED OPERATION IS REQUIRED
TO BE PERFORMED ONLY ONCE X SUBSEQUENTLY CONDITIONS
WILL BE THE NORMAL ONES WHICH WILL REQUIRE NO REPEAT NO
FURTHER PRECAUTIONS AND SPECIAL CONSIDERATIONS X

MIKE X TESTS AND DEVELOPMENT WORK HAVE DEMONSTRATED
THAT ALL OF THE ABOVE SPECIFIED PROCEDURES CAN BE CARRIED
OUT SAFELY AND WITHOUT EXPOSING PERSONNEL TO ANY HAZARDS
X HOWEVER IN ORDER TO INSURE ABSOLUTE SAFETY PERSONNEL
SHOULD BE SUPERVISED AND PRECAUTIONS DESCRIBED IN REFER
ENCE LETTER OBSERVED X THE RADIOACTIVITY PRESENT IS OF
VERY LOW INTENSITY X SOME OF THE PROCEDURES SPECIFIED
ARE FOR SECURITY REASONS ONLY X

NAN X VESSELS BEING DEACTIVATED AND THOSE SCHEDULED
FOR DISPOSAL WILL REQUIRE SOMEWHAT DIFFERENT INSTRU
CTIONS X THESE WILL BE PROMULGATED AT AN EARLY DATE BY
BUREAU OF SHIPS X

OBOE X ADDRESSEES PASS TO TYPE COMMANDERS AND VESSELS
INVOLVED X

PETER X REQUEST RADIOLOGICAL SAFETY OFFICERS IN HAVEN
AND SAN FRANCISCO FURNISH BUSHIPS CODE 180 AND BUMED
COPIES OF ALL MONITOR REPORTS TO DATE AND FUTURE MON
ITORINGS X

ROSS T MCINTIER
CHIEF OF THE BUREAU OF
MEDICINE AND SURGERY

E L COCHRANE
CHIEF OF THE BUREAU
OF SHIPS

CC: CNO
CJTF1
NAVSHIPYDS, PUGET SOUND
NAVSHIPYDS, MARE ISLAND
NAVSHIPYDS, SANFRAN
NAVAL SHIP REPAIR BASE, GUAM

NAVSHIPYDS, TERM ISLAND
NAVSHIPYDS, PEARL
RADSAFE IN HAVEN
RADSAFE COMTWELVE
NAVAL SHIP REPAIR BASE,
SAN DIEGO

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All/Crossroads/FS/L9(180) NAVY DEPARTMENT
All/Crossroads (P2) BUREAU OF SHIPS
Serial No. 1383 WASHINGTON, 25, D. C.

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AIRMAIL

26 SEPTEMBER 1946

SPEEDLETTER

TO: CINCPAC
COMWESSEAFRON
COMSERVPAC
COMTWELVE
COM19THFLT

REFERENCE BUSHIPS BUMED SPEEDLETTER SERIAL 1383 OF 24
SEPTEMBER X MODIFY PARAGRAPH ABL AS FOLLOWS X DE
LETE SENTENCE QUOTE FILL EVAPORATORS WITH THIS SOLU
TION TO TOP OF TUBE NESTS UNQUOTE X SUBSTITUTE FOR
THIS SENTENCE THE FOLLOWING QUOTE X FILL EVAPORATORS
WITH THIS SOLUTION TO AS NEAR TOP OF SHELL AS PRACTIC
ABLE X TAKE NECESSARY STEPS TO PREVENT SOLUTION SPIL
LING OVER INTO ANY PART OF FRESH WATER SYSTEM BY
BLANKING OFF AT PIPE FLANGES AS NECESSARY X UNQUOTE X
DELETE SENTENCE ALSO IN PARAGRAPH ABL QUOTE X REMOVE
SOLUTION AND FLUSH THOROUGHLY UNQUOTE REPLACE WITH
FOLLOWING SENTENCE QUOTE X REMOVE SOLUTION FLUSH
THOROUGHLY USING BOILER COMPOUND IN FLUSHING WATER
UNTIL REMAINING ACID IS NEUTRALIZED X FINALLY FLUSH
THOROUGHLY WITH FRESH WATER X INSURE BY TESTS THAT
NONE OF ACID SOLUTION HAS GAINED ACCESS TO ANY PORTION
OF ENTIRE SYSTEM WHICH NORMALLY IS IN CONTACT WITH
FRESH WATER OR VAPOR X UNQUOTE

CC: CNO	S S KENNEDY
BUMED	By Direction
CJTF1	Asst. Chief of Bureau
NAVSHIPYD, PUGET SOUND	for Ship Maintenance
NAVSHIPYD, MARE ISLAND	
NAVSHIPYD, SAN FRAN	
NAVSHIPYD, TERM ISLAND	NAVAL SHIP REPAIR BASE,
NAVSHIPYD, PEARL	SAN DIEGO
RADSAFE IN HAVEN	NAVAL SHIP REPAIR BASE,
RADSAFE COMTWELVE	GUAM

SECRET

CONFIDENTIAL

FROM BuShips Code 180 Solberg/ 022120Z
TO ComWesSeaFron
INFO BuMed, CNO, CJTF-1, Com19thFlt, Com-12.

URDIS 271945Z X HIGHLY DESIRABLE ACCOMPLISH APPLIC
ABLE ITEMS SPECIFIED IN SPEEDLETTER 1381 ON ALL VES
SELS X ADDITIONAL WORK ON SALT WATER LINES OF IN
ACTIVE AND DISPOSAL VESSELS WILL BE AUTHORIZED SOON
WHEN PROCEDURES ARE PERFECTED X SPECIAL DOCKING
OF CONTAMINATED DISPOSAL VESSELS NOT REPEAT NOT YET
DECIDED.

2120/02 OCT MJ 022120# 271945 1381

CONFIDENTIAL

SECRET

RESTRICTED

FROM: BUSHIPS/BUMED/141550Z
TO : CWSF

INFO :	CNO	COMMARIANS
	COM 11	COMBATCRUPAC
	COM 12	COMSERVPAC
	COM 13	COMNAVSHIPYD SAN FRAN
	COM 14	COMSHIPREBASE SAN
	CJTF-1	DIEGO
	CINCPAC	RADSAFE KWAJALEIN
	COMNAVSHIPYD PEARL	COMPHIBSPAC
	COMNAVSHIPYD BREMERTON	COM19THFLEET
	COMNAVSHIPYD TERMINAL I	COMDESPAC
	COMAIRPAC	COMNAVPHIL
	NAVREBASE GUAM	

SHIPS FORCE ALL CROSSROADS NON TARGET VESSELS AUTH
ORIZED PROCEED IMMEDIATELY WITH ONE ACID CLEANING

EVAPORATORS ACCORDANCE JOINT BUSHIPS BUMED SPDLTR
SERIAL 1381 AND BUSHIPS SPDLTR SERIAL 1383 ALSO ONE ACID

CLEANING SALT WATER SYSTEMS INCLUDING FOREMAIN FLUSHING
COOLING AND DRAINAGE PIPING COMMA PUMPS COMMA COOLERS
AND OTHER HEAT TRANSFER APPARATUS EXCEPT CONDENSERS

USING FOLLOWING METHOD X ABLE X FILL SYSTEM WITH
SOLUTION OF ONE GALLON EIGHTEEN DEGREE BUMED COM

MERCIAL MURIATIC ACID TO TEN GALLONS FRESH WATER AND
IF AVAILABLE TWO OUNCES OF INHIBITOR EITHER OR RODINE

41 OR RODINE 67 X BAKER X AFTER SYSTEM IS FILLED LET
SOLUTION STAND FOR ABOUT FOUR HOURS X CHARLIE X DRAIN

AND FLUSH THOROUGHLY WITH SALT WATER FOR THIRTY MIN
UTES X DOG X FLUSH SYSTEM WITH NEUTRALIZING SOLUTION
OF BCLER COMPOUND UNTIL TESTS SHOW ALKALINE REACTION X

SECRET

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USED ACID SOLUTION TO BE DISPOSED OF AT SEA X USE STANDARD SAFETY PRECAUTIONS FOR HANDLING ACID X ABOVE

CLEANING MAY SLIGHTLY AFFECT OLD VALVE STEM PACKING AND GASKETS BUT IN MOST CASES NO SERIOUS DAMAGE WILL

RESULT X BOIL OUT SALT WATER SIDES OF MAIN AND AUXILIARY CONDENSERS USING PROCEDURE SPECIFIED FOR CLEANING

STEAM SIDES AS OUTLINE BY PARA FOUR SIX DASH FIVE EIGHT BUSHIPS MANUAL 1946 X REPORTS OF COMPLETION OF WORK

SHOULD BE MADE TO BUSHIPS WITH INFO TO INTERESTED COMMANDS X FOR WORK ON ALL NON TARGET VESSELS NO SPECIAL

PROTECTIVE CLOTHING OR DEVICES REQUIRED X SKIN CONTACT WITH CONTAMINATED MATERIALS SHOULD BE AVOIDED AND PERSONNEL ACTUALLY HANDLING THEM SHOULD WEAR

GLOVES WHICH MAY BE DISCARDED ON COMPLETION OF JOB X PERSONNEL CLEANING MARINE GROWTH FROM SHIPS SIDES IN

DRYDOCK SHOULD WEAR ORDINARY LONG SLEEVED WORK CLOTHING CAP GLOVES AND RUBBER BOOTS X SAND BLASTING CREWS REQUIRE ONLY CLOTHING ORDINARILY WORN IN THIS

OPERATION X COMPLETE DETAILED INSTRUCTIONS FOR WORK REQUIRED FOR FINAL CLEARANCE ALL NON TARGET VESSELS

BEING PREPARED X COMMANDER HOFFMAN NOW AT NAVSHIP YARD SANFRAN IS BUSHIPS REP AVAILABLE FOR CONSULTATION

ON ANY NECESSARY DETAILED INFORMATION X MONITORS NOT REQUIRED FOR THESE OPERATIONS BUT SHOULD BE USED IF

AVAILABLE X COMPLETE MONITORING AFTER WORK IS COMPLETED IS REQUIRED X SHOULD BE REQUESTED AT FIRST OPPORTUNITY AFTER ARRIVAL IN PORT X THIS AMPLIFIES JOINT BUSHIPS BUMED SPDLTR SERIAL 1381 AND TO BE USED IN CONNECTION THEREWITH X

SECRET

FROM: BUSHIPS
TO : CINCPAC
COMWESSEAFRON

25 OCTOBER 1046

INFO: COMSERVPAC
COMBATCRUPAC
COMDESPAC
COMINPAC
COMPHIBSPAC
COMSUBPAC
COMAIRPAC

CJTF-1
BUMED
CNO
COM 11, 12
COM 13, 14
COMMARIANAS

242130Z NCR 167

REQUEST ALL CROSSROADS NON TARGET VESSELS EXCEPT
THOSE WITH FINAL RADIOLOGICAL CLEARANCE BE DIRECTED

INITIATE SOON AS PRACTICABLE AND EXPEDITE ALL POSSIBLE
DECONTAMINATION OF EVAPORATORS AND SALT WATER SYSTEMS

ACCORDANCE JOINT BUSHIPS BUMED SPDLTR SER 1381, BUSHIPS
SPDLTR SER 1383 AND BUSHIPS DISPATCH 141550Z XXX

BUSHIPS...ORIG
CJTF-1...BUMED...OP04...414...OP03(33)...

R E S T R I C T E D

242130Z

BUSHIPS Code 180 NAVY DEPARTMENT
All/Crossroads/S99-(2) BUREAU OF SHIPS 6 November 1946
and
BUREAU OF MEDICINE AND SURGERY
WASHINGTON 25, D.C.

CONFIDENTIAL SPEEDLETTER
A-I-R M-A-I-L

TO: COMWESSEAFRON

RE BUSHIPS BUMED 141550Z OCTOBER X DELETE PORTION READ-
ING QUOTE BOIL OUT SALT WATER SIDES OF MAIN AND AUXILIARY
CONDENSERS USING PROCEDURE SPECIFIED FOR CLEANING STEAM
SIDES AS OUTLINED PARA FORTY-SIX DASH FIFTY-EIGHT BUSHIPS
MANUAL NINETEEN FORTY-SIX UNQUOTE X SUBSTITUTE THE FOLLOW-
ING QUOTE CONDUCT ONE ACID CLEANING OF SALT WATER SIDES OF
ALL CONTAMINATED CONDENSERS EXCEPT MAIN CONDENSERS USING
A ONE-HALF NORMAL SOLUTION OF EIGHTEEN DEGREE BAUME
COMMERCIAL MURIATIC ACID AND FRESH WATER X ALLOW SOLUTION
TO STAND IN CONDENSERS FOR ONE HOUR X DRAIN OFF ACID FLUSH
THOROUGHLY WITH SALT WATER THEN NEUTRALIZE WITH BOILER
COMPOUND SOLUTION AND REFLUSH X UPON COMPLETION OF CLEAN-
ING MAKE COMPLETE INSPECTION OF CONDENSER WITH SPECIAL
ATTENTION TO TUBE ENDS WHICH ARE PACKED X CONDUCT TIGHT-
NESS TEST X UNQUOTE X

cc: ComEleven	ComNavShipYd TI	T.A. SOLBERG
ComTwelve	ComNavRepBase SD	By direction of
ComThirteen	ComNavShipYd MI	Chief of Bureau
ComFourteen	RadSafe Kwaj	
CNO	ComMarianas	
CinCPac	ComBatCruPac	
ComServPac	ComDesPac	
Com19thFlt	ComAirPac	
ComNavShipYdPearl	NavRepBaseGuam	
ComNavShipYdBrem	ComNavForPhil	
ComNavShipYdSF	ComPhlpsPac	

C-O-N-F-I-D-E-N-T-I-A-L

SECRET

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P2-4
(WSF-07-bn)
Serial: 0564

Staff Headquarters
WESTERN SEA FRONTIER
Federal Office Building
San Francisco 2, California

CONFIDENTIAL

18 November 1946

From: Commander Western Sea Frontier
To: Commandant Eleventh Naval District
Commandant Twelfth Naval District
Commandant Thirteenth Naval District
Commandant Fourteenth Naval District

Subj: Radiological Monitoring Organization.

Ref: (a) CJTF-1 Conf. ltr. JTF-1/J-3, L9-7, Serial 079 of
9 September 1946.
(b) CNO Conf. ltr. Op-602/cn serial 021P602(Sc) S67-1 of
27 August 1946.
(c) Joint BuShips-BuMed Conf. Spdltr. Serial 1381 of
24 September 1946.

1. Reference (a) established the initial organization for radiological monitoring and clearance of Bikini vessels. With the dissolution of Joint Task Force ONE, a modified organization for continuing the monitoring and clearance of contaminated vessels has been established and supersedes that constituted by reference (a). The nature and functions of the new organization are set forth below for information and guidance.

2. A radiological safety organization is established at Naval Shipyard San Francisco under Commander Western Sea Frontier to Coordinate monitoring and clearance of all crossroads vessels on the West Coast and Pearl Harbor areas. This organization performs the following functions:

(a) Distributes monitor and radiological detection instruments as required and available to Commandants of the Eleventh, Twelfth, Thirteenth and Fourteenth Naval Districts.

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P2-4
(WSF-07-bn)
Serial: 0564

CONFIDENTIAL

18 November 1946

Subj: Radiological Monitoring Organization

(b) Furnishes technical instructions and field guidance to radiological monitors in accordance with instructions received from the Bureau of Ships.

(c) Maintains complete records as to the radiological status of all suspect vessels and keeps files of all monitor reports.

(d) Maintains a Ship Clearance Board consisting of qualified personnel to review monitor reports, advise commanding officers as to decontamination measures required for operational and final clearance, and submit recommendations to Commander Western Sea Frontier for granting operational clearance and to Bureau of Ships and Bureau of Medicine and Surgery for granting final clearance.

3. Requests for monitoring by Crossroads vessels will be submitted to District Commandants in which vessels arrive or are located on the West Coast or Pearl Harbor areas. Monitoring offices are established at Naval Shipyards Puget Sound, San Francisco, Mare Island, Naval Base Commands Terminal Island and Pearl Harbor, and Eleventh Naval District Headquarters.

4. Upon completion of each monitoring of a Crossroads vessel, the local monitor office will provide the Commanding Officer of the vessel with an immediate report of the results obtained, will advise him as to what portions of the vessel require decontamination, and will insure that all applicable Bureau of Ships directives as to prescribed decontamination measures are available on board. It is necessary to observe, however, that the monitor acts in an advisory capacity only, and any recommendations he may make are subject to review and modification by the Ship Clearance Board. The Senior

SECRET

P2-4
(WSF-07-bn)
Serial: 0564

CONFIDENTIAL

18 November 1946

Subj: Radiological Monitoring Organization

Monitor in each area will forward immediately to BuShips (Code 180A), BuMed (RadSafe), Commander Western Sea Frontier and RadSafe Headquarters Naval Shipyard San Francisco a full report on each vessel monitored. All copies of monitor reports must be signed by the monitors performing inspections.

5. Commander Western Sea Frontier will grant operational clearance signifying that all normal operation, maintenance and repair can be carried out without hazard provided the safety precautions specified in reference (c) are observed in handling contaminated material. The Bureau of Ships and Bureau of Medicine and Surgery will jointly grant final radiological clearance indicating that no further radiological hazard of any type exists on the ship and that further monitoring of radiological safety precautions are not required.

6. Detailed instructions to monitors will be promulgated by separate correspondence.

/s/
L. J. BROUSSARD
Flag Secretary

V. H. RADSDALE,
Deputy

CONFIDENTIAL

SECRET

-2-2-
P P P

SNC WNDE V WNG NR C 119 P

FROM: BUMED 222127Z
FOR ACTION COMMANDER WESTERN SEA FRONTIER/SNC

INFO BUSHIPS/WNDE

RESTRICTED

COMPLETE BUMED BUSHIPS INSTRUCTIONS INCLUDING TOLERANCES
IN MAIL TODAY X LATTER BASED ON MEDICAL ADVISORY BOARD
RECOMMENDATIONS X IMPRACTICABLE TO HAVE TWO FORMS OF
FINAL CLEARANCE BASED ON WHETHER ACTIVE SHIPS OR INACTIVE
DISPOSAL SHIPS X OPERATIONAL CLEARANCE ONLY WILL BE GRANTED
TO A SHIP UNTIL SUCH TIME AS FINAL CLEARANCE STANDARDS
APPLICABLE ALL SHIPS CAN BE MET X THESE INSTRUCTIONS AND
PROCEDURES FIRM

2127Z/22 NOV NY 222127Z

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Note: This directive supersedes CJTF-1 Serial 079 of 9 September 1946. (See Appendix II) and Joint BuShips-BuMed Serial 1381 of 24 September 1946 (Appendix IV).

BUSHIPS Code 180-A NAVY DEPARTMENT
All/Crossroads/C-S(99)-(0) BUREAU OF SHIPS
and
BUREAU OF MEDICINE AND SURGERY

CONFIDENTIAL

22 November 1946

From: BuShips - BuMed.
To : Distribution List.

Subject: Radiological Clearance and Decontamination Procedures for Crossroads Non-target Vessels.

References: (a) CWSF Conf. Ltr. P2-4 (WSF-07-bn) Serial 0564 of 11/18/46.
(b) CNO Conf. ltr. Op-602/cm ser 021 P602(SC) S67-1 of 27 August 1946.
(c) CJTF-1 Conf. ltr. ser 079 of 9 Sept. 1946.
(d) BuShips-BuMed Conf. Spdltr ser 1381 of 24 Sept. 1946.
(e) BuShips Conf. spdltr ser 1383 of 26 Sept. 1946.
(f) BuShips-BuMed Conf. disp 141550Z of October.
(g) BuShips-BuMed Conf. spdltr All/Crossroads/S99-2 of 6 Nov. 1946.

Enclosures: (A) General Radiological Safety Precautions.
(B) Radiological Decontamination Procedures.

1. The operating portion of Joint Task Force One included a large number of non-target vessels. Many of these vessels entered Bikini Lagoon subsequent to Test Baker, and at a time when radioactive materials were suspended in the waters in low concentrations. Some of this material contaminated most portions of the vessels exposed to the water of the lagoon. Thus evaporators, condensers, salt water cooling systems with their heat exchangers, fire and flushing

systems, under water bodies of hulls, and fittings and equipage in contact with the sea water were contaminated in varying degrees when used in the lagoon after Test Baker. The radioactive material was found to be concentrated principally in marine growth, rust and salt scale deposits on the affected surfaces. The quantities of radioactive materials present were, in general, found to be in proportion to the quantities of fouling, scale, and rust present on the exposed surfaces and to the length of time during which they were in contact with the contaminated water.

2. All of the ships involved (target vessels not included) have low radiation intensities and small amounts of contaminating materials. They present no danger from external radiation. Any danger to personnel which may exist involves the introduction of contaminating toxic materials into the body. This can occur in any one of three ways, namely: (a) by the inhalation of contaminated dust or inhalation of fumes or vapors from heating contaminated materials; (b) by way of the mouth from contaminated hands or through ingestion of water or food which is contaminated; or (c) by absorption of contaminated material through cuts or wounds. Considering the relatively small quantities of toxic material present in any one ship and the great amount of gross material with which it is mixed (marine growth, scale, rust) and the quantities of this gross material necessary to gain access to the body in order to produce physical injury due to radioactive effects it is NOT LIKELY that personnel engaged in routine operations or maintenance of these vessels will suffer injury. It is CERTAIN they will not suffer injury if the precautions directed are followed, and the established clearance procedures complied with. The Bureau of Medicine and Surgery has established certain tolerance limits on the basis of recommendations made by an advisory board of experts in this field of toxicology. These are in conformity with nationally accepted standards for safety in regard to external radiation and to radioactive hazards within the body. For reasons of absolute safety and to insure that no form of radiological hazard may arise subsequently regardless of the ultimate disposal of the ships, clearances will be granted only in accordance with these standards.

3. Reference (a) established a radiological monitoring and clearance organization to determine the extent of radioactive contamination existing on any Crossroads vessel in the West Coast or Pearl Harbor area. The monitoring results disclose what portions

of the vessel require decontamination to reduce the radioactive materials to a level at which they could never give rise to a question of hazard. Reference (b) assigns the Bureau of Medicine and Surgery cognizance and responsibility for the establishment of radiological safety tolerances and regulations. Reference (b) also charges the Bureau of Ships with responsibility for developing methods and equipment for radiological decontamination of ships.

4. Enclosure (A) is a compilation of all general radiological safety precautions to be observed in handling contaminated materials and in carrying out decontamination procedures. Enclosure (A) contains all currently approved decontamination measures to be used in obtaining Operational Clearance, and Final Radiological Clearance, and supersedes references (c) to (g) inclusive. Include as much of this as possible in "at sea" work.

5. Clearances are defined as follows:

(1) Operational Clearance indicates that all normal operations, repairs and maintenance can be carried out without radiological hazard provided the precautions set forth in Enclosure (A) for handling contaminated materials are observed. This is the clearance required for the normal operation of active ships.

(2) Final Clearance indicates that no radiological hazard of any type, no matter how remote, exists on the ship and that further monitoring is not required. It will apply in like manner to operating ships and to ships destined for inactivation or disposal. Before final clearance can be granted the monitors reports and recommendations for such clearance must be forwarded to Chief of the Bureau of Medicine and Surgery and the Chief of the Bureau of Ships, one complete set of reports to each Bureau. Inasmuch as this is the clearance required of all ships prior to inactivation or disposal, it is desirable that all ships satisfy the requirements for final clearance as early as practicable.

6. Clearances are granted as follows:

(1) Operational Clearance is granted by the Commander, Western Sea Frontier on recommendation of CWSF ship Clearance

SECRET

Board in accordance with safety tolerances and practices established by BuMed and in accordance with the procedures for clearance, monitoring and reporting established jointly by BuShips - BuMed.

(2) Final Clearance is granted by BuShips with the advice and concurrence of BuMed after review of the complete and final monitoring report for the individual ship.

7. The criteria for clearance are:

(1) The existence of any areas of radioactivity with readings in excess of 0.1r gamma or 0.5r gamma beta combined is considered as above safety tolerance for external radiation and will be immediately decontaminated or disposed of, and there will be taken such other precautions as are required to insure safety of personnel. Serious radioactive hazard, not involving external radiation, will exist in enclosed salt water systems which give a reading of 0.1r gamma through the metal of the system. All areas of contamination within closed salt water systems with readings between 0.1 and 0.01 gamma on external reading will be decontaminated immediately.

(2) Operational Clearance MAY be granted for urgent reasons when readings are:

(a) Maximum, shielded, between 0.1 and 0.001r gamma.

(b) Maximum, unshielded, between 0.5 and 0.005r gamma beta combined except underwater bodies with surface readings having statistical averages between 0.5 and 0.02 beta gamma combined.

Operational Clearance WILL be granted when readings are:

(a) Maximum, shielded, between 0.01 and 0.001r gamma.

(b) Maximum, unshielded, between 0.05 and 0.005r gamma beta combined except hulls of ships external surface readings having statistical averages between 0.05 and 0.02 beta gamma combined.

(3) Final Clearance will be granted when readings are:

(a) Maximum, shielded, not above 0.001r gamma.

(b) Maximum, unshielded, not above 0.005 gamma beta combined.

Exception (a) Underwater body, readings statistically

averaged not above 0.02r beta gamma combined and with no single localized area in excess of 0.1r beta gamma combined.

Exception (b) salt water systems having external readings ninety-four (94) per cent of which are not above 0.001r gamma, five (5) per cent not above 0.005r gamma and, one (1) per cent not above 0.01r gamma.

8. Responsible individuals expedite final clearances by seeing that necessary cleaning is done to bring contaminated areas within the final clearance levels prior to submitting reports with requests for final clearance.

9. Drydocking for radiological purposes will not be required when the following conditions exist: Exterior underwater surfaces (including sea water intakes and overboard discharges from the opening in the hull to the first valve) have averaged statistical readings less than 0.02r combined beta and gamma with no localized area above 0.1r beta gamma. Docking will be referred to the Bureau of Ships for decisions.

10. All radiation intensity readings will be corrected to 1 October 1946 for purposes of assessing radiological hazards and granting clearance. No differentiation will be made between wet and dry conditions of surfaces in applying the standards set forth above, all readings are in roentgens per 24 hours (r/day).

ROSS T MC INTIRE,
Vice-Admiral, USN.
Chief of Bureau of
Medicine and Surgery.

EARL W MILLS,
Vice-Admiral, USN.
Chief of Bureau of Ships.

SECRET

GENERAL RADIOLOGICAL SAFETY PRECAUTIONS CROSSROADS VESSELS

1. All non-target vessels which entered Bikini Lagoon after the Atomic bomb tests are more or less contaminated by radioactive materials which were picked up from the water in the lagoon. The parts of the ships which were in contact with sea water are the principal areas which are affected, namely:

- (a) The underwater body of the ship and appendages.
- (b) The interior of the fire and flushing systems.
- (c) The salt water sides of condensers, heat exchangers, salt water pumps and associated salt water piping used while in the lagoon.
- (d) The interior of the evaporators and associated salt water piping.
- (e) The exterior hull and salt water cooling systems of small boats.
- (f) Anchors, anchor chain and chain locker.
- (g) Lines, fenders and similar equipment used at Bikini, also stowages for these items and for small boats.

The majority of the above areas no longer have sufficient hazard from external radiation to be of concern. The potential danger involved at the present time is that of an individual being poisoned by the radioactive materials which are present. The only way the latter action can be dangerous is by an individual eating, breathing, or getting into an open cut or a skin abrasion a sufficient quantity of this radioactive material.

2. The safety precautions which are enumerated herein are designed to prevent any possibility of hazard due to radioactive toxicity.

(a) At the earliest possible date obtain a complete monitoring in order to know specifically the location and relative quantity of radioactive materials present. Until a suspect unit has been pronounced clear by a monitor it should be regarded as contaminated.

(b) As soon as practicable thereafter proceed with the authorized decontamination measures for the fouled locations. When these are completed request remonitoring to ascertain if they have been completely effective.

ENCLOSURE (A)

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(c) If it is necessary to open up a contaminated system the following precautions should be observed:

(1) Keep wet until found clear of contamination all surfaces which have been exposed to salt water. This will effectively prevent extensive amounts of dust forming.

(2) If it is necessary to perform any work on a contaminated unit, clean the part thoroughly before working on it. Remove all rust scale, marine growth, and sediment while wet.

(3) Skin contact with radioactive materials shall be avoided. For this reason, gloves should be worn when working on a contaminated part or in handling materials which have been removed from contaminated surfaces. When working on a large contaminated surface with the body comes in contact, such as manual cleaning of the inside of a main condenser or when removing contamination from the underwater body of the ship, long sleeved work clothing, gloves and caps should be worn. Under these circumstances the clothing worn during the work should be laundered daily or on completion of the job. When sandblasting of the underwater body in drydock is required for decontamination, the clothing ordinarily worn in this operation is satisfactory, but should be laundered on completion of the work. During drydock work on contaminated ships, rubber boots should be worn and thoroughly hosed off after completing the work.

(4) Observe scrupulous cleanliness in the removal of radioactive materials. Every effort should be made to prevent spreading such materials. They must be kept wet and placed in a closed container for disposal by sinking at sea at the first available opportunity.

(5) Tools and equipment used in removal of contaminated materials should be thoroughly cleaned upon completion of work. Rags, fiber brushes, brooms, etc., should be washed upon completion of use or disposed of with the contaminated materials.

(6) Where welding, brazing, or flame cutting of contaminated piping or surfaces is accomplished adequate exhaust ventilation must be assured.

(7) All solutions used in decontamination have the ordinary industrial hazards and, in addition, when they have been circulated in a suspect system are a radioactive hazard. Used solutions should be disposed of at least 10 miles at sea or beyond the 100 fathom curve.

ENCLOSURE (A)

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(8) Where decontamination of the underwater body of the ship is required, all rust and marine growth removed in drydock shall be handled in accordance with instructions in subparagraph (4) above. If wet sandblasting is required for decontamination, the sand should be gathered up and prepared for sinking at sea.

(9) Contaminated piping, valves, and other units which are removed for replacement before decontamination shall be segregated and disposed of at sea.

(10) Loose contaminated materials which are awaiting disposal should be segregated and labeled to prevent unwitting use or meddling. Open sources of radioactive debris should not be left untended. If necessary to leave a contaminated unit open for a period of time it should be covered temporarily when no work is in progress.

ENCLOSURE (A)

SECRET

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RADIOLOGICAL DECONTAMINATION PROCEDURES

1. When exterior radiation readings above approved tolerance levels are obtained on radiologically suspect parts of non-target crossroads vessels, all ships should carry out the decontamination procedures specified herein for the parts affected. This work should be accomplished at the earliest practicable date without interfering with the operating schedule. Attention is directed to the safety precautions outlined in Enclosure (A); all applicable portions must be observed while conducting the decontamination procedure. The principal decontamination agent used is a muriatic acid base with other materials added as noted in the procedure for each unit. Several general industrial safety precautions which must be used in handling the acid are noted:

- (a) Mix the acid in open air if possible.
- (b) Pour the acid into the water slowly, never the water into the acid.
- (c) Personnel engaged in handling and mixing acid should wear rubber gloves, splash proof goggles, and acid fume respirators. Bicarbonate of soda solution should be available as a neutralizer in event of spilling or splashing acid on personnel. Soda ash or boiler compound should be available for neutralizing that spilled on the ship.
- (d) When large units such as evaporators and condensers are treated, some quantities of hydrogen gas may be given off. If practicable they should be vented to the outside atmosphere. In any event no open lights or sparking devices should be permitted in the immediate vicinity of the operation or vent.
- (e) DO NOT heat the acid solution.
- (f) All connections, many of which may be temporary, made for the purpose of circulating the acid solution shall be tested with plain water before actual operation.
- (g) While the acid solution is circulating, a continuous watch shall be maintained on all parts of the system for the purpose of promptly detecting any leaks which may develop and applying remedial measures.
- (h) All valves which are closed to prevent entry of acid solution into a part of the system in which it is not desired to circulate the acid should be tagged and wired or tied shut.

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ENCLOSURE (B)

2. The procedures given below are the approved radiological decontamination methods for each unit and system which has been found to contain radioactive materials:

A. EVAPORATORS. (Except Badger types having AA or AAA type heat exchangers).

(1) Evaporators should be given one or more thermal shock treatments to break loose as much scale as possible.

(2) All loose scale and any zincs in heat exchangers should be removed and prepared for disposition.

(3) The distilling plant is to be set up to provide for acid circulation through the entire salt water system, i.e. shells, salt water and brine piping, pumps and heat exchangers. This involves:

(a) Positive prevention of the acid solution getting into the fresh water side of the system shall be accomplished by removal of necessary lines and blanking off the ends.

(b) An acid mixing tank should be provided; an ordinary steel tank will suffice. It is desirable that the tank be large enough to mix a sufficient quantity of solution to fill the system, although several mixes may be used to fill the system.

(c) A filling line shall be run from the acid tank to the suction side of the pump selected to circulate the acid through the system. A line or lines should be run from the brine discharge or other appropriate drain lines back to the acid mixing tank. Rubber lined firehose may be used for the temporary lines.

(4) The acid solution should be mixed by adding two parts 18° Baume commercial muriatic acid to 15 parts fresh water. Where salt water or brine lines are steel or galvanized wrought iron pipes an inhibitor (Rodene-Navy Spec. 51-I-2a) shall be added in the proportion one part inhibitor to 100 parts of the commercial acid added.

(5) Fill the system completely. The shells must be vented as near the top as possible in order to accomplish complete filling of the shell. When the acid solution enters the shells considerable foaming will occur and may come out the vents. Buckets should be placed to catch all overflow.

ENCLOSURE (B)

SECRET

(6) The acid shall then be continuously recirculated until all scale in the shell and tube nests is dissolved. This may be detected visually. The normality of the acid should be checked during the operation and not allowed to fall below one normal. Where scale is unusually heavy it may be necessary to add additional acid to complete the process. The circulation should in any case be for at least two (2) hours, but not over four (4).

(7) Upon completion of circulation drain the system completely to remove all acid. Drain all pockets, particularly the lines which were blanked off (drains from baffle pan and vapor line). Flush the system thoroughly by circulating fresh water and pumping overboard. Flush baffles particularly, and remainder of inside of shell thoroughly by firehose through the sight ports and redrain. The acid removed should be handled as a contaminated material.

(8) The system shall then be flushed out with a boiler compound solution to neutralize any residual acidity.

(9) The plant may then be reassembled, replacing any zincs which were removed, and placed in operation. If a monitor is available it is desirable to check the sufficiency of the treatment before proceeding to break down the acid circulating system and reassemble the plant. All distilled fresh water manufactured in the first twenty-four (24) hours after placing the plant back in operation shall be dumped overboard.

(10) Upon remonitoring it may be found that certain parts are extensive a complete reapplication of the procedure may be necessary. Generally if all scale is removed from the shell and tube nest it will be found easier and more effective to disassemble the unit above tolerance and clean, either manually or by separate acid washing. All parts which occasionally have been found to require separate treatment are cited:

- (a) At least one set of baffles at the top of first effect shell.
- (b) Distiller condenser heads.
- (c) Brine overboard discharge line at elbows and valves.
- (d) Some parts of brine overboard pump where acid circulation was incomplete or ineffective.
- (e) Strainers on the suction side of the salt water pump.

ENCLOSURE (B)

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A-1. Badger type evaporators having Double A or Triple A heat exchangers shall be boiled out for 96 hours at a temperature of 200° Fahrenheit using one pound of boiler compound to ten gallons of water. Associated salt water piping should be cleaned as specified for the fire and flushing systems.

ENCLOSURE (B)

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B. SALT WATER SYSTEMS

The following steps shall be used in cleaning those portions of the salt water systems which monitoring reveals to be so contaminated as to exceed established tolerance levels. The salt water systems involved include fire and flushing systems, salt water sides of cooling systems with associated heat exchangers except condensers, pumps, and drainage piping associated with these systems. Parts of systems showing acceptable monitor readings should be excluded from the cleaning process of they can be isolated.

- (1) Place a large mixing tank on deck in a suitable location to run a hose or piping to the suction side of a pump serving the system to be treated. Arrange the suction of the pump, if possible, to allow taking suction on the mixing tank, salt water or on air alternately. Provide recirculating connections by hose from parts of the system most remote from the pump and lead back to discharge into the mixing tank.
- (2) Fill special mixing tank with solution of one gallon 18° Baume commercial muriatic acid to ten gallons fresh water and two ounces inhibitor (Rodene-Navy Spec. 51-I-2a) if available.
- (3) Drain systems to be cleaned as completely as possible using drain connections on pumps and as available at low points of systems. Open outlets or vents in systems to permit air to enter for effecting complete drainage. Water thus drained may be pumped overboard in the harbor or at sea.
- (4) Fill system with acid solution from mixing tank introducing through pumps selected. The systems should be filled completely with the solution which will probably involve the preparation of several mixes. Outlets on the system are to be opened until it is determined by flow that the decontamination solution has reached all parts of the system. As each line is filled, the associated outlet is closed until all parts are filled and all outlets closed.

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- (5) After the system has been filled completely, recirculate the acid solution using the pump and the recirculating lines provided back to the mixing tank. This process should be continued for about four (4) hours. During this period the normality of the acid should be checked by sampling the acid added as needed to maintain at least 1/2 normal strength.
- (6) Upon completion of decontamination circulation, if the ship is in dock, drain acid solution from system as completely as possible using drains provided and collect solution in suitable containers for disposal as prescribed for contaminated materials. If the vessel is at sea, discharge the solution overboard upon completion of circulation using drains found to be contaminated. For vessels in harbors or alongside piers, the acid solution shall be drained into containers provided. Drain lines outboard of sea valves are considered as parts of the hull and shall be treated with the underwater boxy as required at first drydocking.
- (7) After draining acid solution, flush the entire system thoroughly with salt water for at least one hour using all available outlets for discharge. For ships not at sea this water may be pumped into harbors.
- (8) After the salt water flushing, prepare a neutralizing solution in the special mixing tank using 50 pounds of boiler compound to 1,000 gallons of water. Drain the system and fill with the neutralizing solution using the same process as for the decontaminating solution. Recirculate the neutralizing solution for at least thirty minutes.
- (9) As a final step in the process, shift the pump back to sea suction and flush the entire system thoroughly with salt water using each outlet for thirty minutes.
- (10) Remonitoring after decontamination may reveal that the system has not been entirely reduced to tolerance limits. In such cases, the troublesome areas generally will be found in pockets

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in the system such as large valves, at reducer stations or in stagnant sections of lines. When such cases occur, the parts remaining above tolerance should be removed if practicable and any remaining collection of scale, silt or fouling removed manually. The part should then be given an acid dip in a one normal solution of muriatic acid and fresh water for about ten minutes to remove any residue and then thoroughly neutralized and rinsed. When large parts of systems or a whole system remain above tolerance after applying the above methods, the system shall be given a second acid treatment as set forth above. If the system then fails to respond, the Bureau of Ships shall be advised of the conditions and necessary instructions requested.

C. CONDENSERS EXCEPT MAIN CONDENSERS.

Salt water sides of all condensers except main condensers which show readings above acceptable limits shall be treated as follows:

- (1) Completely drain condenser and remove zincs. Place zincs aside for disposal as required for contaminated materials removed.
- (2) Set up mixing tank in convenient location on deck equipped with hose to lead to condenser for filling with solution by gravity.
- (3) Fill mixing tank with solution of one gallon 18° Baume commercial muriatic acid to twenty gallons of fresh water, and two ounces of inhibitor (Rodene-Navy Spec. 51-I-2a).
- (4) Fill condenser and associated piping with solution preparing additional mixes as necessary to fill completely. Insure complete filling by leaving vents open to release air and to check when full by flow from vents. Place containers at vents to collect solution which will escape from boiling action of acid.
- (5) Circulate solution through condenser if possible for one hour, otherwise allow to stand in condenser for one hour. If in

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harbor drain off solution and dispose of as required for contaminated materials removed. If at sea, discharge solution overboard through regular overboard lines.

- (6) Flush entire system completely for one hour using salt water and discharging overboard.
- (7) Using mixing tank provided, fill condenser with neutralizing solution of fifty pounds boiler compound to 1,000 gallons of water. Circulate if possible or allow this solution to stand in condenser for at least thirty minutes. Then reflush thoroughly using salt water and discharge overboard.
- (8) Remonitor condenser. If readings are still above tolerance levels, remove all necessary inspection plates and determine location of remaining contamination. If heads are contaminated remove scale and fouling from surfaces manually and brush with one normal acid mixture until readings have reached tolerance level. If tubes show contamination remaining, punch tubes using rod and wet rag to remove material adhering to surface. Follow this by lancing thoroughly with water. Collect and dispose of all removed material as required by Radiological Safety Precautions (Enclosure (A)).
- (9) Make complete inspection of condenser to locate and repair any damage which may have been caused in the process with special attention to tube ends which are packed. Put air test on condenser and remedy any leaks.

D. MAIN CONDENSERS.

Main condensers which show monitor readings above final clearance limits should be treated in accordance with the following procedure:

- (1) Drain condenser and remove zincs. Set zincs aside for disposal in accordance with procedures set forth for disposing of contaminated materials by Radiological Safety Precautions.
- (2) Remove all scale, rust and marine growth from inside of con-

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denser heads by scrapers and wire brushes keeping the surface wet at all times. If radioactive materials are still present in measurable quantities, scrub condenser heads and salt water sides of tube sheets with ordinary scrub brush and a solution of one gallon of 18° Baume commercial muriatic acid to ten gallons of fresh water and two ounces of inhibitor (Rodene-Navy Specs. 51-I-2a) if available. Flush off surfaces thoroughly with salt water to remove acid.

- (3) If tubes show readings above final clearance limits, punch tubes with a rod and wet rag to remove material adhering to surface and wash out with a water lance.
- (4) Collect and dispose of all loose material removed in accordance with instructions for handling contaminated materials in Radiological Safety Precautions.
- (5) On completion of above work flush condenser thoroughly with salt water discharging overboard for at least one hour.
- (6) Remonitor, and if readings are still above limits, repeat the process.

E. UNDERWATER BODY.

The necessity for drydocking ships for decontamination purposes generally will be determined by listing and trimming the suspect vessels as much as practicable by shifting liquids and monitoring portions of underwater bodies thus exposed. Readings of at least ten representative areas on each side of the exposed underwater body will be taken with readings spaced as evenly as practicable. The average of these readings on each side will be considered as representative of the general radiological condition of the underwater body. If the average of the readings so obtained is .020 or less roentgens/day combined beta and gamma corrected to 1 October 1946, the underwater body will be considered as meeting the requirements for final clearance and no further precautions are required. On vessels being drydocked for other reasons, the underwater body will systematically monitored in drydock as outlined in the standard monitor forms. The average intensity of radiation on the under-

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water body so determined will then be used in the same manner as when listing the ship to determine whether decontamination is required. When the average underwater body readings as specified above is found to be above .020 roentgens/day, the underwater body will require decontamination in drydock and the following procedure shall be followed:

- (1) Remove marine growth using long handled scrapers. During this operation the sides of the ship and the drydock floor shall be kept wet at all times to prevent the formation of dust. Upon completion of scraping, the sides and the bottom of the ship shall be hosed down vigorously using salt water at high pressure. Materials removed shall be gathered up and disposed of as prescribed for contaminated materials in the Radiological Safety Precautions (Enclosure (A)).
- (2) Remonitor the underwater body to obtain the new statistical average of radiation intensity. If the hull then meets the established tolerance limits no further radiological precautions are necessary and normal work may proceed.
- (3) If remonitoring after scraping and hosing reveals that established tolerance levels have not yet been met, the underwater body must be wet sandblasted for decontamination purposes. The standard wet sandblasting procedure is satisfactory for this purpose and will remove the radioactive material. Upon completion of the sandblasting, the topside, sides and bottom of the ship and the sides of the dock shall be washed down to collect all sand in the bottom of the dock and the ship re-monitored. The sand shall then be collected and disposed of as required for contaminated materials removed by Radiological Safety Precautions (Enclosure (A)). After removal of the sand, the drydock floor shall be washed down vigorously and the water pumped into the harbor.

F. SHIPS BOATS.

The ship's boats which were used in the lagoon in many cases picked up an amount of radioactivity on the exterior hulls and in the

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engine cooling systems.

- (a) Wood hull boats when found to be above tolerance are to be decontaminated by removing the bottom paint by use of a strong solution of lye and boiler compound. This solution will soften the paint after being applied generously and being allowed to stand for about a half hour. The paint may then be scraped off. The scrapings should be treated as contaminated materials and the Safety Precautions given in enclosure (A) observed in their removal and handling. The underwater body should then be washed thoroughly to remove all lye and boiler compound and remonitored if a monitor is available. The boat should then be repainted in accordance with painting instructions when pronounced clear. Boats fitted with steel rubbing strips on the keels may retain some quantity of radioactive material under the strips where they are rusted or where the wood is partially rotted. In these cases the rubbing strips should be removed, rust cleared off, rotted wood removed, if practicable, and rubbing strip replaced.
- (b) Steel hull boats, if readings are above tolerance, should be treated as the underwater body of the ship given in (E) above.
- (c) Engine cooling systems and tailpipes found to be radioactive shall be treated as specified for the salt water piping by (B) above.
- (d) Boat propellers found to be contaminated shall be scraped and then washed with an acid mixture as prepared for the salt water piping.

G. HULL, HULL FITTINGS AND DECK EQUIPMENT.

Exposed areas of the ship's hull (other than the underwater body), hull fittings, ground tackle and other deck equipment found to have radiation readings in excess of final clearance limits shall be treated as follows:

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- (1) Exposed surfaces of the hull or hull fittings, if painted, shall be scrubbed thoroughly with a strong solution of lye and boiler compound using long-handled scrubbers and scraped to remove as much of paint as possible in the process. The lye and boiler compound solution should be made up of about 4 1/2 pounds of lye and 5 pounds of boiler compound to 10 gallons of fresh water. Unpainted or rusty surfaces shall be scrubbed in a similar manner using a solution of one gallon 18° Baume commercial muriatic acid to 10 gallons of fresh water and two ounces of inhibitor (Rodene-Navy Specs. 51-I-2a) if available. Upon completion of scrubbing each area of one or two square yards, hose down vigorously affected parts and decks in the vicinity with salt water to remove all of the solution.
- (2) Anchor chain and anchors if above final limits shall be sandblasted at the first opportunity. To decontaminate chain lockers which exceed final limits, gather up all loose scale and rust keepint it wet at all times and dispose of in accordance with instructions for contaminated materials in Radiological Safety Precautions. Then hose down decks, bulkheads and overheads vigorously with salt water and pump overboard.
- (3) Miscellaneous deck equipment made of fibrous vegetable material such as lines, fenders, brooms, swabs, scrubbers and the like are not susceptible to any known method of decontamination at this time. If any of these items exceed final clearance limits they should be segregated and disposed of as specified for contaminated materials removed in Radiological Safety Precautions.
- (4) Deck equipment such as internal combustion engine driven pumps having salt water cooling systems shall be treated by circulating acid solution as prescribed for salt water systems and heat exchangers in section (B) above.
- (5) If after the above treatment any of the affected parts show readings still above final clearance limits, the processes shall be repeated until limits are met.

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 ARD-29 LCT-1359
 ATA-124 LCT-1361
 ATA-180 LCT-1377
 ATA-185 LCT-1420
 ATA-187 LCT-1461
 ATA-192 LST-388
 ATR-40 LST-817
 ATR-87 LST-861
 LCI-977 LST-881
 LCI-1062 PGM-23
 LCI-1067 PGM-24
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 LCT-1155 PGM-31
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C-O-N-F-I-D-E-N-T-I-A-L

DRAFTED: FEE/Payne

FROM: BUSHIPS

TO: RADSAFE NAVSHIPYD SAN FRAN

27 NOV 1946

INFO: COMWESSEAFRON
GUNSTON HALL (LSD5)
CNB TERMINAL ISLAND

272307Z

BALLAST TANKS AND CONNECTING PIPING IN L S DOGS REUR
251805Z ARE TO BE CONSIDERED AS PART OF UNDERWATER BODY
FOR GRANTING RADIOLOGICAL CLEARANCE X BALLAST PUMPS
AND PIPING IN COMPARTMENTS OTHER THAN TANKS TO BE CON-
SIDERED SAME AS OTHER SALT WATER SYSTEMS FOR CLEARANCE X
BUMED CONCURS X

272307Z

C O N F I D E N T I A L

DRAFTER: FEE/FISHER

FROM: BUSHIPS

RELEASED: T. A. SOLBERG

4 DECEMBER 1946

TO: COMWESSEAFRON COM 11

NAVSHIPYD SAN FRAN, COM 12

NAVSHIPYD PUGET SOUND

NAVSHIPYD MARE ISLAND

NAVSHIPYD TERMINAL IS

NAVSHIPYD NORFOLK, COM 13

NAVSHIPYD PEARL, COM 14

NAVSHIPYD SANDIEGO, COM 15

ATC 11 KWAJ, COMMARIANAS

COMNAVPHIL

CINCPAC

COMSERV PAC CNO

032138Z

NCR 1162

ON BASIS FURTHER STUDY RADIOLOGICAL HAZARDS AND CON-
FERENCES WITH BUMED, MANHATTAN DISTRICT, RADIOLOGICAL
SAFETY ADVISOR AND UNIVCAL REPRESENTATIVES FOLLOWING
DECISIONS MADE. NO HEALTH OR SECURITY HAZARDS ARE
PRESENT IN FOLLOWING PROCEDURES. THESE INSTRUCTIONS
SUPERSEDE PREVIOUS RESTRICTIONS IMPOSED AND WILL BE IN-
CORPORATED IN CHANGE TO MY CONF LTR ALL/ALL CROSSROADS
/C S(99) (0) OF 22 NOVEMBER 1946: A. SPECIAL DISPOSAL OF SAND
USED IN WET SANDBLASTING UNDERWATER BODIES CROSSROADS
NON TARGET VESSELS NOT REQUIRED. B. MARINE GROWTH AND
SCALE REMOVED FROM VESSELS AT FIRST DRYDOCKING SHALL
BE SEGREGATED AND SUNK AT SEA AS PREVIOUSLY PRESCRIBED.
C. ACID AND OTHER DECONTAMINATING SOLUTIONS USED IN
CLEARING SALT WATER SYSTEMS MAY BE DISCHARGED INTO
HARBORS. SOLUTIONS SHOULD BE DISCHARGED AT SLOW RATE OR
BY PROVIDING A FLOW OF WATER ALONG WITH DISCHARGE SO AS
TO DILUTE THE SOLUTION ABOUT ONE FOURTH. DISCHARGE SHOULD
BE MADE WELL CLEAR OF DOCKS AND SHORE LINE DURING EBB
TIDE. D. SCALES AND MARINE GROWTHS REMOVED MANUALLY
FROM EVAPORATORS AND SALT WATER SYSTEMS SHALL BE SEG-
REGATED AND SUNK AT SEA AS HERETOFORE. E. ALL PROCEDURES
SHOULD BE TREATED AS ROUTINE IN ORDER TO MINIMIZE ANY
ADVERSE PUBLICITY. BUMED CONCURS.

Page 53

SECRET

BUSHIPS CODE 180-A NAVY DEPARTMENT BUMED/GML/df
S(99)-(0)(180-A) BUREAU OF SHIPS Serial: 0584 (SC)
and

BUREAU OF MEDICINE AND SURGERY
CONFIDENTIAL WASHINGTON 25, D.C.

17 December 1946

To: DISTRUBUTION LIST.

Subj: Radiological Clearance and Decontamination Procedures for
CROSSROADS Non-target Vessels.

Ref: (a) BuShips-BuMed Conf. ltr of same subject All/Crossroads/
C-S(99)-(0) dated 22 Nov 1946.

1. Reference (a) outlined the procedure for granting radiological clearance to Bikini non-target vessels and contained, as enclosures, general radiological safety precautions and radiological decontamination procedures.

2. Subsequent investigation has revealed that certain requirements with respect to tolerances, disposal of sandblasting sand and discharge of used decontamination solutions can be relaxed.

3. The following changes have therefore been affected in the requirements and procedures specified by reference (a). It is requested that changes be made immediately by all holders of the reference.

(a) Page 4, subparagraph 7(3), change Exception (a) to read as follows: "Underwater body, at least twenty readings as equally spaced as practicable, ten on each side, statistically averaged do not exceed 0.02r beta gamma combined with no single localized area in excess of 0.1r beta gamma combined. For clearance purposes, the underwater body will be considered to include all salt water injections and overboards to the first sea valve. The same criteria as specified for clearance of underwater bodies will apply to anchors, anchor chain, chain lockers, and underwater bodies of small boats."

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(b) Page 4, subparagraph 7(3), change Exception (b) to read as follows: "Salt water systems when ninety-four (94) per cent of the total areas exposed to sea water in the systems have external readings not above 0.001r gamma, five (5) per cent not above 0.005r gamma, and one (1) per cent not above 0.01r gamma.

(c) Enclosure (A), subparagraph 2(c)(7), change to read as follows: "(7) All solutions used in decontamination have the ordinary industrial hazards. Used solutions may be dumped at sea, preferably through contaminated outlets or overboard discharges, or in harbors for ships in port or in drydock. When used solutions are discharged into harbors, the process should be carried out at a slow rate and a flow of water provided to dilute the decontaminating solution about four to one. The solution should also be discharged well clear of docks and shoreline, and at the commencement of an ebb tide if possible."

(d) Enclosure (A), subparagraph 2(c)(8), change to read as follows: "When decontamination of the underwater body of the ship is required, all rust and marine growth removed in dock shall be handled in accordance with instructions in subparagraph (4) above. If wet sand blasting is required for decontamination or is accomplished, no special handling or disposal of sand for radiological purposes is required. In cases where a ship requires underwater body decontamination in drydock and sandblasting is accomplished without preliminary scraping of the fouling and marine growth, the mixture of sand and marine growth removed must be gathered up and disposed of in accordance with instructions in sub-paragraph (4) above."

(e) Enclosure (B), page 2, subparagraph 2A(7), delete last sentence reading "The acid removed should be handled as a contaminated material".

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(f) Enclosure (B), page 4, subparagraph 2B(1), change second sentence to read as follows: "Arrange the suction of the pump, if practicable, to take suction on the mixing tank for the acid treatment and subsequent neutralization, and on salt water for the dumping and flushing".

(g) Enclosure (B), page 4, subparagraph 2B(6), delete entire subparagraph and substitute the following: "Upon completion of decontamination circulation, discharge the solution overboard using drains found to be contaminated. If the discharge is made into a harbor, it shall be accomplished as specified in Enclosure (A), subparagraph 2(7). For clearance purposes, all salt water lines and parts of systems outboard of sea valves are considered as parts of the hull and shall be treated with the underwater body as required at first drydocking."

(h) Enclosure (B), page 6, subparagraph 2C(5), delete second and third sentences and substitute the following: "On completion of acid treatment, discharge solution overboard through regular overboard lines, following precautions set forth in enclosure (A), subparagraph 2(7), if in a harbor."

(i) Enclosure (B), page 8, subparagraph 2E(3), delete fourth sentence starting "The sand shall then be collected" and substitute the following: "If the underwater body requires decontamination and sandblasting is undertaken without scraping as outlined in subparagraph (1) above, the sand shall be collected and disposed of as required for contaminated materials removed as specified by Radiological Safety Precautions (Encl. (A))."

T.A. SOLBERG
By direction
Chief of Bureau of Ships

C.A. SWANSON
Chief of Bureau of
Medicine and Surgery

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ComDesLant	CHIKASKIA (AO-54)
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ORCA (AVP-49)	ATA-124 LCT-1361
OTTAWA (AKA-101)	ATA-180 LCT-1377
PALMYRA (ARST-3)	ATA-185 LCT-1420
PHAON (ARB-3)	ATA-187 LCT-1461
POLLUX (AKS-4)	ATA-192 LST-388
PRESERVER (ARS-8)	ATR-40 LST-817
PRESQUE ISLE (APB-44)	ATR-87 LST-861
QUARTZ (IX-50)	LCI-977 LST-881
RECLAIMER (ARS-42)	LCI-1062 PGM-23
R.K. HUNTINGTON (DD-781)	LCI-1067 PGM-24
TOMBIGBEE (AOG-11)	LCI-1091 PGM-25
ROCKBRIDGE (APA-228)	LCT-1130 PGM-29
ROCKINGHAM (APA-229)	LCT-1155 PGM-31
ROCKWALL (APA-230)	LCT-1184 PGM-32
ROLETTE (AKA-99)	YMS-354 LCI-329
SAIDOR (CVE-117)	YMS-358 LCI-549
SAN MARCOS (LSD-25)	YMS-413 LCI-615
SHAKAMOXON (AN88)	YMS-463
SIOUX (ATF-75)	CONNYNHAM (DD-371)
SPHINX (ARL-24)	CORTLAND (APA-75)
SAINT CROIX (APA-231)	FILLMORE (APA83)
SUNCOCK (AN-80)	GENEVA (APA-86)
SYLVANIA (AKA-44)	NIAGARA (APA-87)

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APPENDIX V
MISCELLANEOUS
CONFERENCE NOTES

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D 32602

COPY

FROM: COMWESSEAFRON
ACTION: BUSHIPS
BUMED
DATE 28 SEPTEMBER 1946

280110Z

ATTENTION BUSHIPS CODE 180.

AS RESULT CONFERENCE, DOCTOR HAMILTON BERKELEY 27TH
RECOMMEND FOLLOWING REVISION PARAGRAPH "H" YOUR
SERIAL 1381. PIPING AND FOULING REMOVED SHOULD BE KEPT
WET UNTIL DUMPED AT SEA. MATERIAL SHOULD NOT BE AL-
LOWED TO DRY. ALL SALT WATER PIPING HAVING READINGS
.1 ROENTGEN OR OVER PER DAY SHOULD BE CLEANED WITH
BUFFER SOLUTION. SAME FOR PIPING WITH READINGS LESS
THAN .1 BUT GREATER THAN .01 IN MORE THAN 25% OF SYS-
TEM. WILL PROCEED ON ABOVE BASIS PENDING DECISION. FOR
DISPOSAL AND INACTIVATION, SHIPS SALTWATER PIPING SHOULD
BE CLEANED

BUSHIPSACT

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REPORT OF CONFERENCE
San Francisco Naval Shipyard

Meeting at 1100, 1 October 1946.

Present were: Dr. F. H. Rodenbaugh
Dr. K. G. Scott
Capt. W. E. Walsh (MC) USN
Capt. Wynn, USN
Capt. Lemler, USN
Capt. Maxwell, USN
Lt. Comdr. Turnbaugh, USN
Lt. Comdr. Skow, USN
Lt. Chadbourn (MC) USN
Lt. (jg) Morton (MC) USN
Lt. Howell, USNR
Mr. Hammond
Mr. Gordon
Comdr. Hoffman

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Maxwell: We called this conference together to make certain recommendations to BuShips on the means and methods to decontaminate salt water piping based on experiments conducted at this Yard - using ammonium citrate solution and muriatic acid solution. We found that muriatic acid removes all the foreign matter and activity. It does a complete job. The ammonium citrate does a similar job to a lesser extent - about 90% of the activity is removed. We found a medicine that can be used - it may not be the best, etc.

Dr. Scott and Dr. Rodenbaugh, are you in a position to give us a few answers that we are after - when should we use this medicine - what standard should we use - when should we use the acid and when should we use the citrate thru the salt water system?

Rodenbaugh: You mean as to how much radiation you have in the systems? You may ask me from a medical point of view, but ask Dr. Scott about the physical aspects.

Maxwell: Dr. Scott?

Scott: You are putting me on the spot. I think before we get right down to this concrete problem as to when we should use this medicine, I am still trying to get clear what I had hoped an earlier conference would accomplish - that is to weld this large uncompletely connected unit into a little more tight organization so that we can function to the point where what the Lab in Berkeley has to offer can be more readily used by the Navy. I feel that even now we are not informed to the extent we should be in order to give you the maximum amount of advice that we could. I think someone, preferably someone who is a radio chemist, should be given more or less some type of directing authority so that we can coordinate on these various activities which are going on in about three different places. I recommend Mr. Morton, who is here now, for this position. He has had a lot of training in this field and is in the service. Experimental work of this nature should be under observation by a radio chemist so that we always get the maximum of information from it.

The other thing I think should be done is the type of thing Dr. Hamilton suggests - that is, we should repeat these findings that we have done on the underwater body

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and perhaps welding on salt water lines so that we are absolutely certain that we are right. One true experiment doesn't mean it is a fact. On the hull cleaning programs, what appears to be safe should be checked several times in order to be absolutely sure we are right.

With respect to the exact question - when should we decontaminate ships? I think everyone realizes that the radiation behind a pipe which gives you 1/10 R a day over a long length may eventually turn into a lethal dose of radiation. This might conceivably occur if you had a trans-location of radioactive matter so that it all collected in one spot. You may then unduly expose personnel getting into this spot. The question is, where can we set the limit? We can not say it 1/10 R a day. Dr. Hamilton thinks 1/100 R a day, which he seems to think is safe. He certainly would change his mind in view of other facts which he does not know at present. For instance, is there a normal trans-location of solid matter in pipe lines. I don't have a recommendation to give unless I can get more facts. I don't know if rust can move from one side to another, - I don't know the mass involved - or that we can actually get this activity in one pile. I would like to make quantitative measurements of the total radioactivity in a ship's system before setting any limit to which we should strive in decontamination. Then I think that someone like Dr. Rodenbaugh can tell us whether or not it is dangerous.

I think that so far the work has been considerably well controlled. Considering the different groups of people that have gotten together, we have done a very satisfactory job, but I do think perhaps BuShips and our group at Berkeley and someone in Captain Walsh's office should get together and more or less plan any large experiments which are done from beginning to end before the decisions are made so that we can have the benefit of the services of the three groups.

The other thing is a question of dissemination of information. I am never aware just what the monitors have done. I think we should have more system and some one person become the organizer of this thing so that

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the various groups can get full information when it is available.

Maxwell: You mentioned Dr. Morton?

Scott: He would be the logical choice to properly consider these problems and see the various sides of it since he is in the services. I would suggest him to be the go-between man. He is in a position to see everyone's side of the question. I do think you should have other people represented. You have people such as Turnbaugh and someone in the medical angle - these people could get together and in a very short conversation could decide whether or not something could be done. We don't have as much point to our meetings here as a group of 2 or 3 men. The Yard chemists should also get into this - he is doing the industrial chemistry.

Walsh: We could set up an organization now - get a group together - Morton, Chadbourn, Skow (representing me), Turnbaugh, Mr. Gordon.

Morton: In order to determine all these things, Dr. Scott has brought out, I feel that first of all the mutual interchange of information is the most important thing, and we all have to get together in getting this information. In other words, the monitors are going to help the Lab. at Berkeley, Berkeley help the Lab. here, etc. We want to find out whether or not a ship is a radiological hazard. To do so we have to have the monitorings. We want to see how it is monitored so that we can have some idea what is going on. Those parts that are not tagged and we want to see that samples are taken for the Lab. Whoever happens to be the "leg" man should go along with the monitors and present his ideas and arrive at some idea as to the practical method to be used. That way, we can calculate the volume, size, location and total mass of debris. We can get together with the men in BuShips who know the possibility of translocation of the debris - actually what the possibilities of its accumulating in one place. We can get together with the medical men and together determine whether or not the ship should be decontaminated. Once that is determined - whether or not the ship is to be decontaminated - the Lab. again comes into the point of view in determining whether or not decontamination has actually been achieved.

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Maxwell: Dr. Morton could assume responsibility of coordination between the Yard and the University, be under Lt. Commander Skow's supervision, insofar as monitoring of ships is concerned.

Morton: We don't know all the difficulties arising in monitoring - we can't give you the information you seek unless we can get together.

Maxwell: Captain Walsh, monitoring is just a rough indication of what we are really after - the alpha emitters - is that right?

Walsh: That's right.

Scott: I don't think I would use the word "rough" - it is a peculiar situation - the relationship of alpha to beta and gamma. It is the final word as far as a ship is concerned. It is almost precise as far as clearance goes. However, I think that we are going to have to go to the Lab. to test these methods of decontamination to know precisely what we are doing. One thing I would like to bring out - Captain Maxwell made the statement that hydrochloric acid works better than possibly citrate. That may be true, but I can't say it is true unless I have done it twenty times. The alpha problem if riddance isn't made now will remain a long time, and it is quite poisonous. Some Laboratory such as we have must check these things as true before a decision can be made.

Maxwell: You are now checking muriatic acid to see if it removes the alpha as well as the other?

Scott: Yes, we are running an assay now on acid samples taken from one of the yard's decontamination process. We can get an alpha count to see how effective the acid is. We have checked this particular point with the citrate, and we are sure that it takes out the alpha as well as the other emissions which show on the monitor's instrument. Before any decisions or statements are made, there should be facts. We should be sure that everybody in this group agrees that they are facts. Everyone can scrutinize the statements in this case. The acid story is not complete until we have done all the laboratory work on it, although the monitor may say that the acid treatment has reduced his readings to zero.

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Turnbaugh: This matter of setting up an organization, and of conducting large scale experiments, also of calculating total radioactivity on ship is going to take considerable time to organize, time to run experiments, and considerable time for making conclusions from it. The immediate problem is to pin down a low radioactive limit to strive for. Can we for the present go ahead on the decontamination of the ships based upon some definite outside (gamma) value which you are sure is safe?

Scott: If 25% of the ship's salt water lines read more than 1/100 R per day, this ship should be decontaminated.

Turnbaugh: We can use that basis now and clear what ships are in here.

Scott: If we can get the answers which we are asking we can sit down and figure out what sort of hazards we might have. Then we can set a low limit.

Rodenbaugh: We are in a different position than we were while in Bikini.

Scott: I would say we are about 60% along the road of completion.

Turnbaugh: How soon do you think you will have the assay complete on the acid solution you have? We have to make our decision between the muriatic acid and the citrate.

Scott: I think this afternoon, we were fortunate in getting Mr. Morrison from Washington who is now doing the assay. The reason I come to this group is to present the attitude of "what do you want to know" so that I can find out what you need and try to deliver it to you. How far do you want the Lab. to go in research, etc.? I want to find those things out so that we can find out how it can be done.

Walsh: I was talking to Dr. Lyon yesterday and asked him to pass the information to a certain party - that long range policy is a little out of my field. The decision has to be made for benefit of BuShips and BuMed.

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Maxwell: I would like to hear from Dr. Rodenbaugh.

Rodenbaugh: I have the impression that the great interest that we have in going over these ships is to find the amount of activity we are dealing with before we can fix the hazard. The activity is not smoothly distributed in the salt water lines - you would have a difficult time estimating how much radiation you have. I sat with a medical board to get some sort of an over-all view. Each ship was different and had to be discussed individually. The decision wasn't easy to make - you could not measure the substance and so the operation was stopped at Bikini. The health hazards of radiation - I have seen a lot of late reactions. I would be very loath indeed to feel that we should take any chance on these hazards until we know more about it. The only protection you have against these things is to stay away from it. As long as it is in the pipe it is all right, but when you take it out that is when you get into trouble. There is a tremendous amount of radiation material on these ships. We still don't know just how much these ships have on them. The pipe lines and the outside hull are two different things.

Scott: The hull - we are safe and my recommendation was, that we could clean ships one hundred times as active as the one we had (LAFLEY). My suggestion was that the sand be dumped at sea. The activity is mixed up in many tons of sand. What we have to avoid is getting this activity in a very small concentrated area. It would seem to me that that operation could be perfectly safe, but on pipe lines we want to be sure that we are doing it in the right manner.

Maxwell: To get back to the question of piping, would it be possible that we take a representative of the pipes aboard ship that's well known to be most contaminated. For example, I would say the auxiliary injection is one of the most contaminated - we take that as a representative section. Then, take one from the evaporator brine and maybe one from the flushing system. Open those pipes and remove the representative section of debris for analysis. Couldn't you work up some kind of a survey so that we can use that as a guide on whether to decontaminate other ships?

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Scott: Yes. I suppose BuShips knows where scale and rust tends to collect - Where the scale and rust collects is where the activity will collect.

Howell: The bad part of that was illustrated on the BENEVOLENCE. Two feet away from a hot spot rading of 0.9 gamma there is a negligible reading. There seems to be an accumulation around flanges, joints, valves, etc.

Scott: We have to find these places, and I would suggest that these places be minutely gone over.

? On these ships here, where they had these different heavy marine growth, would that show up on the instruments?

Turnbaugh: Yes - It definitely showed hotter reading than other places.

Morton: I would like to interject what has been brought up - samples in the lab. are of no value unless this information is coordinated. It so happens that we do not get a homogeneous example. We must know if we are to give you the information on whether or not to decontaminate.

Turnbaugh: As long as these active spots are scattered around, it seems that the job of calculating total activity in a ship to determine whether or not to decontaminate is going to be a big job. It seems simpler to decontaminate the whole ship.

Scott: You will have a high manpower cost one way or the other.

Turnbaugh: After we decontaminate you can easily get total activity from our used solution.

Lemler: There are three types of ships involved: Active Ships, all of which have operating schedules. This is of most importance and at the same time safety cannot be disregarded. I would suggest that we decontaminate those ships down low until you get to a low figure that's safe beyond a shadow of a doubt. Any information collected during the process will be of value for future ships.

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The second group: Deactivated ships. Time isn't so important so you can do some experimentation; because time is not so important, a planned, controlled experimentation.

Third group: I think your big experimentation can go forward on the target ships that are coming in here. The sole purpose of bringing them here is to see what happens and how you can cure these things. The information you have gathered on the first and second groups you can apply to this third group, taking as much time as you need.

We have our instruction from BuShips as to what to do. It seems to be working so, if we are reasonably sure of being right in the procedure for cleaning the ship up, let's continue on these active ships. We will take out readings as before, and let Dr. Walsh clear the ship using the standards he has; but we will forget the experimentation work on those ships except for collecting data as to what was done. We will on a productive basis comply with BuShips directives in decontaminating.

Scott: I don't really think there is any difference in an experiment and really cleaning up a ship. As far as your difficulty in clearing up pipe lines, I would have suggested a little different procedure which might have saved you time.

In that manner we could not act as consultants. Every time we do a job it is an experiment. I think the entire group is aware of such work. Really, these things are all experiments in a sense. By experimentation I don't think it was meant that we would set this ship aside and keep it as a place where we could work out ideas as they occur to us. Since we have had long experience with the field we are well aware of what is actually happening in those pipes than is someone who is now in this sort of thing.

Maxwell: Commander Hoffman is here from Washington. He has had some experience in this decontamination, at Bikini.

Hoffman: About all we came out for is to see what you are doing. At the present time, what Admiral Solberg particularly wants is to develop a procedure that we can issue as a

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step by step method to any Yard or a ship, and that we are sure will be clear and concise enough to do the results beyond the question of being safe. He wants to take the ROCKBRIDGE particularly to work out such a thing as Dr. Scott suggested - to clean her up so that we can forget that she was ever active.

Maxwell: Let us appoint Commander Hoffman and Dr. Morton to work with the Yard and Berkeley to get this thing rolling. In conclusion, we will recommend to the Bureau these two solutions - the ammonium citrate and the acid if it is favorable (when we hear from Dr. Scott). The yard is to continue with experiments to develop a better method if it is possible. I think with Dr. Morton being in the picture we will get some data which will be of use in preparing definite instructions for decontamination work.

Walsh: I think the next point is to decide about the ROCKBRIDGE.

Maxwell: Go ahead with the decontamination work on ROCKBRIDGE.

Walsh: You propose to use acid on salt water systems?

Maxwell: We must get the answer from Dr. Scott as to whether or not the acid is as effective in removing the alpha particles as the gamma and beta. We know that ammonium citrate does remove the alpha particles, although it doesn't remove sea growth as well as the acid.

Wynn: Do you propose to work the whole system over?

Maxwell: Yes. Is that agreeable? The experimental work will be done at Hunter's Point.

Scott: I don't see why we can't get a lot of valuable information out of work that's being done elsewhere. You are setting up a laboratory at these other yards, are you?

Maxwell: No - just this one. Of course, there will be monitors at the other yards. The other yards are exclusively on the west coast - Puget Sound, Terminal Island, Mare Island.

Lemler: What do we do with the hydrochloric acid - can we pump it at sea 10 miles out?

Scott: It gets diluted there so you don't care if it is active.

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Turnbaugh: We have been considering trying to filter that.

Scott: I rather feel the major part of the activity is dissolved in the acid.

Lemler: A question: we take a section of pipe out and with the idea of replacing it. Our present plans are to take the old pipe to sea and dump it even though the readings say it is not particularly dangerous. Is this for security reasons?

Scott: It may not be dangerous, but if all the rust and scale inside that pipe gets into one lump you could conceivably have a lot of radiation.

Rodenbaugh: It is difficult to get rid of radioactive matter. It may be a lot cheaper to dispose of a valve than to try to get rid of the radiation hazard on the valve.

Maxwell: Dr. Scott, one more point to be clarified - before we start decontaminating these salt water systems we should have a standard, and that standard was not determined - just a figure that was pulled out of the air. I understand that there is a possibility that the scale and debris may get into one lump and that will cause trouble. Couldn't we find out the amount of activity in the ship - some method we could find out such as the total area of the pipe system, and also the amount of debris in these pipes?

Scott: It seems to me that we could work up some sort of a usable method. We could sample a solution from one of the decontamination jobs. If we know we have removed 90 to 98% of radioactivity in this process then we know how much radioactivity there was in the lines treated. I think you could then assume on a similar ship if you have a similar monitor's report you know how much activity there is. The other way would be to sample the pipe at enough points and get at it that way. A calculated result. That was the type of thing I was going to try to get for you if you could get in these areas. For example, we take the HENRICO - we know by a sample that the rust on the pipe that leads to the crew's head has so much activity per cubic centimeter. I also know the rust is 20 mm deep. Similar observations could be made throughout the ship. Then I think we could

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calculate how much activity we would have in that ship. Then I think we could consult with someone like Dr. Rodenbaugh and see if he thinks that amount is dangerous. Also get together to see if that amount would come together and actually be a hazard. Give me the information as to areas and mass of material in the pipes along with representative samples.

Howell: We have some information for you now.

Scott: We can give you some answer. That's the only way to do this - unless you do it like you did on the destroyer (measuring after the job is done). What I would like to do is break these ships down into units and consider each type of contamination as a different problem. Take evaporators and their lower limit. People obviously aren't going to collect scale or carry it around and I, personally, from what I have seen of evaporators would be willing to clear the things if they read less than 1/10 R a day.

Turnbaugh: It is not merely a question of safety on a ship in the personnel being near an active unit for a twenty-four hour period. The yard has the problem of working on the inside of evaporators and of working valves in the shop. The low limit must consider this.

Scott: There is a point that I am not aware of. My only suggestion there is that any of those operations have to be monitored. I would have to know the actual mechanics of the repair work.

Rodenbaugh: You still would have to know what substances cause emission.

Scott: Our whole premise has been based on knowing the ratio of beta to alpha activity before we would have something to work on. Last month that was worked out in the Lab. to semi completion. If we find that always to be true, I think you can have the control measure.

Lemler: Summarizing this meeting: First, a suggestion was made that we organize a steering committee for the work here. That would be representatives from BuShips, BuMed and U. of C. The purpose of it would be to develop procedures

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and to disseminate information. Second, we will continue along on our present procedures and try to deactivate the active ships to the satisfaction of Dr. Walsh. He provides the monitor. Third, the long range experimentation - my guess is that it will be done on the target ships primarily and on the active ships secondarily.

Scott: I wonder if there is some way we can get this in writing?

Rodenbaugh: I would like to get some samples of this marine growth in pipes.

Scott: I would like to have a list of the selected personnel for this secret and confidential matter to use so I will know who to give this information to.

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C O P Y

R E S T R I C T E D

FROM: BUSHIPS/CODE 180 FEE/b

102030Z

TO: COM TWELVE DIST MED OFF

INFO: BUMED
CJTF ONE

PASS TO CAPTAIN WALSH FOR ACTION X BUSHIPS AND BUMED PROPOSING ESTABLISH LIMITS FOR FINAL RADIOLOGICAL CLEARANCE AND DECONTAMINATION FOR ALL NON TARGET INCLUDING INACTIVE AND DISPOSAL SHIPS AS FOLLOWS X ALL READINGS IN ROETGENS PER DAY COMBINED BETA AND GAMMA CORRECTED TO ONE OCTOBER AND TAKEN AS CLOSE AS PRACTICABLE TO RADIOACTIVE MATERIAL X GRANT FINAL CLEARANCE WHERE ABLE RADIOACTIVE MATERIAL ENCLOSED IN METAL OR OTHER SHIELDING MEDIUM AS IN SALT WATER SYSTEMS IF ALL READINGS ARE POINT ZERO ONE OR LESS SEMICOLON BAKER WHERE NO SHIELDING MEDIA INTERPOSED AS ON HULL OF SHIP IF ALL READINGS POINT ZERO TWO OR LESS X WHEN NOT WITHIN ABOVE LIMIT ABLE AND TWENTY FIVE PERCENT OR LESS READINGS OF THE FOULED SYSTEM ARE BETWEEN POINT ZERO ONE AND POINT ONE DECONTAMINATE SYSTEM OR EQUIPMENT SOON AS PRACTICABLE BUT IF MORE THAN TWENTY FIVE PERCENT ARE ABOVE POINT ZERO ONE OR ANY LOCALIZED AREA EXCEEDS POINT ONE DECONTAMINATE IMMEDIATELY SEMICOLON WHEN NOT WITHIN ABOVE LIMIT BAKER AND READINGS ARE BETWEEN POINT ZERO TWO AND POINT ONE DECONTAMINATE SOON AS PRACTICABLE BUT DECONTAMINATE IMMEDIATELY ANY AREAS READING OVER POINT ONE EXCEPT THAT UNDERWATER HULL NEED NOT BE DECONTAMINATED UNTIL FIRST SCHEDULED DOCKING IF CLEARANCE LIMITS EXCEEDED X WILL OMIT SPECIAL SAND BLASTING OF BOTTOM AT FIRST SCHEDULED DOCKING IF ALL UNDERWATER BODY READINGS ARE POINT ZERO TWO OR LESS X

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ACID CLEAN ALL EVAPORATORS AS PRECAUTION REGARDLESS
OF READINGS X PARA X REQUEST YOU DISCUSS THESE STANDARDS
WITH HAMILTON AND SCOTT AND SEND COMMENTS AND RECOM-
MENDATIONS BY DISPATCH X REQUEST SPECIFIC RECOMMENDA-
TION AS TO LIMITS ABOVE WHICH IMMEDIATE CLEANING CONSI-
DERED NECESSARY FOR SAFETY REASONS AND ANY TIME LIM-
ITATION NECESSARY TO IMPOSE ON CLEANING WHEN CONTAMINA-
TION BELOW THAT REQUIRED IMMEDIATE WORK BUT EXCEEDING
LIMITS FOR FINAL CLEARANCE

2153/10 OCT AC

102030Z

SECRET

Page 75

FROM: COMWESTSEAFRON

OCTOBER 112327Z

TO: BUSHIPS

INFO: BUMED
COM JTF ONE

RESTRICTED X YOUR ONE ZERO TWO ZERO THREE ZERO X CON-
FERRED WITH HAMILTON FOLLOWING COMMENTS SUBMITTED X
ABLE SALT WATER SYSTEMS EVAPORATORS HEAT EXCHANGERS
ECT GAMMA OUTSIDE READINGS POINT ZERO ONE FOR ACTIVE
SHIPS BUT POINT ZERO ZERO ONE FOR INACTIVE AND DISPOSAL
X TWENTY FIVE PERCENT FIGURE OF POINT ZERO ONE AND
POINT ONE ARE CONCURRED IN X BAKER WHERE NO SHIELDING
AS ON HULLS BETA AND GAMMA READINGS POINT ZERO FIVE
FOR ACTIVE VESSELS BUT POINT ZERO ZERO FIVE FOR INAC-
TIVE AND DISPOSAL X WHEN NOT WITHIN LIMIT BAKER AND
READINGS ARE BETWEEN POINT ZERO FIVE AND POINT FIVE
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POINT ONE GAMMA EXCEPT UNDERWATER HULL NEED NOT BE
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ANCE LIMITS EXCEEDED PROVIDED HULL READINGS INSIDE VES-
SEL DO NOT EXCEED ZERO POINT ONE GAMMA X SANDBLASTING
NOT NECESSARY IF ALL UNDERWATER BODY READINGS ARE
POINT ZERO FIVE COMBINED BETA AND GAMMA OR LESS BUT
FOULING SHOULD BE REMOVED USING WET TECHNIQUE X CON-
CUR IN ACID CLEANING EVAPS X SPECIFIC RECOMMENDATION X
IMMEDIATE CLEANING REQUIRED OF ANY EXPOSED AREA WHERE
RADIATION EXCEEDS POINT ONE ROENTGEN BETA AND GAMMA
PER DAY X TIME LIMITATION OF NINE MONTHS FROM ONE OC-
TOBER X STANDARDS RECOMMENDED FOR DISPOSAL AND INAC-
TIVE VESSELS BASED PRIMARILY ON MEDICAL LEGAL AND SE-
CURITY ASPECTS X

(CORRECTED COPY: CORRECTIONS UNDERLINED)

SECRET

14 October 1946

MEMORANDUM FOR FILE

Subj: Radiological Decontamination; Conference Concerning.

1. A conference was held on the subject of Radiological Decontamination in Room 4168, New War Department Bldg. at 0845, 4 October 1946. Those present were:

Vice Admiral Blandy	Commander Langer
Rear Admiral Solberg	Commander Fee
Captain Lyon	Doctor Hamilton
Captain Rivero	Col. Roper
Col. Nichols	

2. Admiral Solberg opened the conference with the remarks that the Navy's radiological decontamination problems are roughly divided into two broad categories: (a) the decontamination of radioactive ships now on hand, and (b) a long range program of radiological decontamination research, development and education. Admiral Blandy stated that the divisions of naval radiological decontamination activity are specifically divided into the following categories:

- (a) Decontamination of active ships for overhaul and operation.
- (b) Decontamination of ships destined for inactivation or disposal (of less immediate importance).
- (c) A long range program of preparation for wartime decontamination measures.
- (d) Sending to navy yards for decontamination the target ships after ammunition has been removed.

3. Admiral Solberg advised that BuShips and BuMed had jointly issued a speedletter prescribing necessary measures to permit active ships to operate without hampering of operation or repair. Final instructions on decontamination measures must be promulgated for active ships for protection of personnel, and for inactive and disposal ships having in mind both medical and legal protection.

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Experimental work is being prosecuted actively at University of California on steel and copper-nickel salt water piping decontamination using hydrochloric acid and ammonium citrate. The Achomawi (ATF-148) is being sent to Hunters Point for development of decontamination measures on this type vessel. This ship's employment produced considerable radioactivity. The Rockbridge (AFA-228) is also undergoing decontamination with complete data being obtained on conditions before and after applying procedures. These experiments will provide information as to decontamination cost which is of vital importance in view of scarcity of funds. It was originally intended to do no work on salt water lines of active ships, but it is now proposed to conduct an acid cleaning at the first overhaul in order that all restrictions can be removed regardless of future disposition. Admiral Solberg outlined the procedures being followed on cleaning of evaporators and underwater bodies. Target vessels are not considered in the same class with non-targets and require special studies for topside decontamination. Salt water lines and evaporators will not be a problem, because these systems were not in use on target ships during the danger period.

4. Admiral Solberg explained that BuShips is now engaged in preparing final instructions for decontamination of all non-target ships. These instructions will supersede all previous directives and will contain an introduction outlining general considerations followed by specific instructions for the three classes of non-target vessels. A draft of the introduction was circulated among the conferees. Admiral Solberg stated that he hopes to get drafts of the instructions to the West Coast personnel for their comment prior to promulgation.

5. Admiral Blandy raised the question of classification of matter regarding decontamination. All agreed that the information should be reduced to a restricted classification and that the public relations angle should be considered carefully to remove confusion and the impression that the Navy is "covering up." This matter is now under study, but must be cleared with Manhattan District.

6. Dr. Hamilton reported that his work on the West Coast is proceeding very satisfactorily and that liaison with the naval activities there is excellent. Dr. Hamilton stressed the need for cleaning salt water lines on ships scheduled for inactivation because of breathing

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hazard due to the practice of blowing air through salt water systems. In the case of active ships, Dr. Hamilton agreed to deferring cleaning up pipe lines on active ships until regular overhaul, but stressed the need for reducing the time elapsed to nine months if possible because of the decay rate of beta material and the difficulty of detecting alpha emitters after decay has progressed beyond that time. Cleaning of bottoms is of least concern and can be deferred until docking is required for other purposes regardless of time involved. The leaching out process of the bottom paint will in most cases cause marine growth to fall off to some degree carrying alpha emitters with it. In this connection Dr. Hamilton suggested experiments with plates prepared with plastic paint and contaminated with radioactive material to determine what can be expected on underwater bodies of ships. He suggested contamination by a mixture of plutonium and fission products. Admiral Solberg raised the question of provision of the material, to which Col. Nichols replied that he felt the arrangements could be made.

7. Dr. Hamilton raised the question of the fundamental relation and function of the University of California in connection with the Army and Navy in their decontamination work. He went on to state that the job should be attacked quickly and thoroughly because of the rapid decay rate of beta material. He also stated that he felt that individuals should be trained both in the technical and overall aspects of decontamination. He recommended that Hunters Point undertake practical naval experimental work with assistance as necessary on technical matters from the University of California. He said that naval personnel or civil service personnel should be trained in this line as civilian personnel are most difficult to obtain for the work. Captain Rivero brought out the fact that recent Naval Academy graduates will in the very near future be recalled from monitor work for sea duty.

8. Admiral Solberg stated that the plan is to train for long term decontamination work. However, the immediate press of work in hand requires personnel on a short term basis to clean up ships already back and those to be sent back in the near future. This will be followed with a long term monitor program for target vessel clean-up. At the present time, the decision must be made as to which group of personnel should be trained in this type of work. At first glance, it would appear that electronics personnel would be the logical choice.

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Dr. Hamilton stated that he considered essential a knowledge of radio-chemistry as well as knowledge of repair and operation of instruments. Admiral Solberg indicated that the chemistry background would not be necessary for immediate work now in hand or for wartime decontamination procedures to which present investigations will lead. Chemists will be required for research work only. Other groups will be trained in sonitoring. These may include all naval officer postgraduate students regardless of what types of courses they are pursuing, damage control officers and other selected groups. The course will be one of probably four weeks duration on decontamination procedures, and will be designed to disseminate knowledge of the problems to be expected and methods of coping with them. Captain Lyon stated that medical personnel will also have a definite training program in radiological decontamination. Admiral Solberg stressed the need for all medical officers to take the course. Dr. Lyon replied that negotiations with BuPers are underway but no definite policy has yet been derived. A five day course to give a general picture to senior medical officers is being developed. The senior officers of BuMed are now observing at the Radiological Safety School, and weekly conferences are held with these officers on determination of school policy.

9. Admiral Solberg explained that there are several major problems facing the Navy, but there are not sufficient personnel available at present to handle them competently. Dr. Hamilton complimented the Navy on the excellent approach already made to the problem and the splendid long range program under consideration.

10. Admiral Solberg advised Dr. Hamilton that samples of radioactive material must be taken from ships as frequently as possible to be analysed for background of experience and to aid in assessment of activity on future ships. According to Dr. Hamilton this procedure is being followed within the limits of present facilities, and although good samples are being obtained, ex-target ships will offer a more fruitful field. Admiral Solberg pointed out that some targets are coming to the West Coast in the immediate future and analysis on these should commence as soon as possible. Dr. Hamilton again stressed the point that in order to handle this work properly, the Army and Navy must make attractive offers to personnel to engage in radiological safety and decontamination. The principal problem in this case is not, as Dr. Lyon thought, a financial one, but rather a case of encouraging

SECRET

competent men to enter the field by assuring them that they will be kept on that particular type of work throughout their employment and will be guaranteed a long term period of service. In this respect Admiral Solberg believed that the Army and Navy must present a united front on the problem in order to gain support of the program and should develop a combined school for education in radiological work. The closest liaison must also be maintained in the development of all phases.

11. Captain Lyon discussed the work of the Navy Radiological Safety School briefly and commented on the instructors and type of lectures being given. He promised to disseminate copies of the material of the course as soon as available in printed form.

12. Dr. Hamilton raised the question of the permanency of the laboratory at Hunters Point. Admiral Solberg indicated that no commitments had been made along this line as yet. He also said that a basic directive for the proper establishment of the laboratory must be developed. No one knows as yet all the phases requiring attention and the development will perforce be a gradual process as more information becomes available. Captain Rivero advised that in the Navy Department Admiral Wright will assume control of new developments in CNO, with Admiral Parsons remaining in charge of Atomic Energy and guided missiles, and in this capacity handling problems resulting from CROSSROADS. Dr. Hamilton believes that his facilities can be of most value in training personnel and assisting in the setting up of the laboratory at Hunters Point. He considered that three or four officers and six pharmacist's mates would suffice for a start. Admiral Solberg advised Col. Nichols that present arrangements between the Navy and University of California are quite satisfactory.

13. Col. Nichols stated that Army problems in radioactivity are very broad and that the question of atomic warfare again requires review. Dr. Hamilton believes round table discussions between the Army, Navy and civilian scientists are in order in developing the subject. Col. Nichols advised Dr. Hamilton that he would like to have from him, when convenient, a suggested long range decontamination program including both Army and Navy and also his thoughts on atomic warfare.

14. Admiral Solberg stated that the Navy's problems are two:

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(a) What type covering can we use to avoid taking up radioactive material?

(b) What are the best decontamination methods for present and prospective materials?

Col. Nichols suggested that the Army and Navy should devote their studies to specific applications of decontamination leaving to civilian scientists the development of the field of general knowledge of radioactivity. Admiral Solberg made the point that all research work in the field must be coordinated, and laboratories and agencies must maintain the closest liaison to avoid duplications and to give all investigators the benefit of new discoveries or developments by individual activities. Dr. Hamilton suggested from this standpoint that it might be advisable to shift the laboratory from Hunters Point to Washington in view of the superior scientific facilities available here. Admiral Solberg said that radiological research and development must be conducted individually and separately from other fields. Dr. Hamilton questioned the possibility of Army-Navy nuclear energy studies. Col. Nichols considered that Manhattan Project is just that. Captain Lyon said that Dr. Hamilton could be of most value in detection and analysis procedures. Dr. Hamilton said that at present the establishment of standards is mainly guess work and calculated risk. The practical side of the work must be considered throughout by persons familiar with ship operating and repair procedures. Further, the more advisers the more ridiculous the standards because of the personal variation in opinions of safe limits. Bi-weekly discussions of new developments and problems and crystallization of ideas would be of great help to all concerned.

15. Col. Nichols questioned Dr. Hamilton as to his additional requirements to accomplish the job before him. Dr. Hamilton advised that he is making satisfactory progress with present facilities by robbing long range research problem studies which he is loath to do. However, he believes the best procedure at present would be to train Navy people to meet immediate problems. Civilian experience will develop naturally in connection with the work as time goes on. Dr. Hamilton suggests that some Army and Navy personnel sit in on the course at Berkeley next spring, without enrolling, merely to obtain a background as to general considerations and problems to be expected. Dr. Hamilton promised to determine

SECRET

from the authorities at University of California whether arrangements can be made to have some of Captain Walsh's and Captain Maxwell's personnel sit in on the course on this basis. Admiral Solberg suggested also that Mr. Gordon, Hunters Point Chemist, be permitted to take the course for information and experience.

16. On being questioned as to standards which could now be adopted for decontamination, Dr. Hamilton stated that the problem is one of determining the total quantity of plutonium in a ship and then determining whether that is a dangerous quantity if accumulated at one spot. Other than this standard, clearance is mainly a case of calculated risk and good judgment. For practical purposes, he indicated that for an active ship, if less than 25% of readings showed as high as .01 to 0.1, decontamination could be omitted, but if 25% of readings were 0.1 or above the ship should be decontaminated immediately.

17. The conference adjourned at 1035.

J. J. FEE,
Commander, U. S. Navy

cc: All present.

SECRET

C O P Y

18 October 1946

MEMORANDUM FOR CAPTAIN WALSH

Subject: Tolerance Figures.

1. For present final radiological clearance can only be on basis of 0.001 for shielded beta and gamma combined and .005 for unshielded beta and gamma combined.

2. It is most desirable that an Advisory Board to BuMed be formally created to act formally on this matter and return report to Chief, BuMed.

3. I will prepare letters of requests to serve on this board for signature of the Surgeon General.

- (a) Dr. Newell
- (b) Dr. Rodenbaugh
- (c) Dr. Scott
- (d) Dr. Hamilton
- (e) Dr. Langham
- (f) Lt. Morton to serve as Secretary
- (g) Captain Walsh to serve as Chairman
- (h) Colonel Warren may be invited when he is available.

4. The letter will set forth the mission of the Board.

5. BuShips representative may be present for deliberations if you desire.

6. Essentially this is strictly a BuMed responsibility - i.e. the placing of (a) levels of tolerance and (b) assessment of hazard not indicated by simple readings (quantity relationships).

G. M. Lyon
Capt., (MC), USNR

SECRET

C O P Y

DRAFTED BY: FEE/kulick

25 OCTOBER 1946

FROM: BUSHIPS

TO: COMWESSEAFRON 252132Z

INFO: BUMED
CJTF-1

ADVISE WHETHER INTERPRETATION UR 112327Z AND 121747Z IS
THAT UNDERWATER BODY MEETS REQUIREMENTS FOR FINAL
CLEARANCE ALL VESSELS IF ALL READINGS ARE POINT ZERO
FIVE COMBINED BETA AND GAMMA OR LESS X ALSO ADVISE
WHETHER READINGS SPECIFIED ARE TAKEN WITH HULL WET OR
DRY X

R E S T R I C T E D

SECRET

C O P Y

WN134

NS163

T3-3-3

P P P

WNDE WNNA SNC V SNFH NR 25 P

FM NAVSHIPYD SANFRAN 301946Z
TO BUSHIPS CODE 180/WNDE

INFO BUMED/WNNA CWSF/SNC

REFURDIS 252132 X INTERPRETATION CORRECT X DRY READINGS
X CAPTAIN WALSH SENDS.

1945Z/80 OCT DK 301946Z 252132

SECRET

C O P Y

DRAFTER: CAPT. LYONS

FROM: BUMED

TO: COMWESSEAFRON

29 OCTOBER 1946

INFO: BUSHIPS

301415Z

NCR 305

ATTENTION CAPT. W. E. WALSH (MC) USN

REQUEST ADVISORY BOARDS RECOMMENDATION REGARDING TAKING READINGS AT WATER LINE AS INDEX OF UNDERWATER BODY CONTAMINATION. ALSO IF THIS IS APPROVED AS A METHOD IF .05 INSTEAD OF .005 CAN BE TAKEN AS LIMIT BELOW WHICH NO FURTHER THOUGHT OR ACTION NEED BE GIVEN TO THE SHIPS HULL AS FAR AS RADIOLOGICAL SAFETY IS CONCERNED. IF POSSIBLE, WOULD LIKE TO ESTABLISH POLICY OF NOT REQUIRING DRY DOCKING FOR RADIOLOGICAL PURPOSES AT ANY TIME FOR ANY SHIP IF HULL READINGS BELOW .05. THIS TO APPLY TO ALL SHIPS. IF THIS NOT ACCEPTABLE TO ADVISORY BOARD, WOULD THEY ACCEPT AVERAGE READINGS .005 SHIELDED AS NEARLY STATISTICALLY DERIVED AS POSSIBLE WITH NO SINGLE AREA OVER .05 IN AN ATTEMPT TO GET AT QUANTITATIVE ASPECT OF CONTAMINATED MATERIAL PRESENT

BUMED....ORIG

BUSHIPS.....414

C O N F I D E N T I A L

301415Z

SECRET

C O P Y

DRAFTER: FEE/hartzog

FROM: BUSHIPS-BUMED

TO: NAVSHIPYDSANFRAN

1 NOVEMBER 1946

INFO: COMWESSEAFRON

012219Z

PASS TO CAPTAIN WALSH FOR ACTION X AT CONFERENCE HELD THIS DATA ON SUBJECT RADIOLOGICAL DECONTAMINATION OF SHIPS COLONEL WARREN MADE FOLLOWING STATEMENTS X OF PRIMARY CONCERN IS TOTAL QUANTITY OF RADIOACTIVE MATERIALS LIKELY TO BE CONCENTRATED IN ONE SPOT OVER PERIOD OF TIME X CONSIDERING NUMBER OF NON TARGET VESSELS AND GEOGRAPHICAL DISTRIBUTION OF RADIOACTIVE MATERIALS FROM UNDERWATER BODIES THESE SHIPS REGARDLESS OF DISPOSITION INCLUDING POSSIBLE SALE FOR SCRAP THEY DO NOT REPEAT NOT PRESENT HEALTH OR SECURITY HAZARD COLLECTIVELY EVEN THOUGH QUANTITY THREE OR FOUR TIMES THAT ON ROCKBRIDGE X COLONEL WARREN THEREFORE CONSIDERS THAT NON TARGET VESSELS WITH QUANTITIES OF RADIOACTIVE MATERIALS ON THE ORDER FIFTY MICROGRAMS REQUIRE NO UNDERWATER BODY DECONTAMINATION FOR FINAL CLEARANCE NOR SPECIAL PRECAUTIONS ON FIRST OR SUBSEQUENT DRYDOCKING X REQUEST THESE FACTS BE BROUGHT TO ATTENTION OF BOARD AT MEETING MONDAY AND CAREFULLY CONSIDERED IN CONNECTION WITH DISCUSSIONS ON FINAL LIMITS X COMDR HOFFMAN BUSHIPS REP ARRIVES HOTSHOT MONDAY WITH FURTHER CONFERENCE NOTES X DESIRE HE ATTEND CONFERENCE AS OBSERVER AND ENGINEERING CONSULTANT BT

C O N F I D E N T I A L

012219Z

SECRET

Page 88

D 32602

C O P Y

C O N F I D E N T I A L

FROM: BUMED

TO: COMWESSEAFRON

DRAFTED BY: G. M. LYON

INFO: BUSHIPS

8 NOV. 1946

082128Z

NCR 588

REUR 071837Z. BOARDS FINDINGS YOUR 060145Z INTERPRETED AS RECOMMENDING AVERAGE WET READING .02 COMBINED BETA AND GAMMA FOR CLEARANCE UNDERWATER BODY. HAD TENTATIVELY ESTABLISHED .1 BETA AND GAMMA AS MAXIMUM ALLOWABLE FOR ANY ONE ISOLATED AREA. BUSH: 071415Z BASED ON THIS LIMIT WITH WHICH SYLVANIA AND WHARTON COMPLY ACCORDANCE DETAILED REPORT NAVSHIPYD PUGET SOUND CONF SPDLTR SER 0770 OF 29 OCT USING HULL READINGS VICINITY WATERLINE AS INDEX C ADVISE PRIORITY IN WHAT RESPECT THIS CONFLICTS WITH BOARDSRECOMMENDATIONS. IN LIGHT OF BOARDS STAND WHAT IS YOUR OPINION IN REGARD TO RECLAIMER BAY FIELD AND POLLUX AS REPORTED IN NAVSHIPYD PUGET SOUND SPDLTR SER 0775 OF 4 NOVEMBER

BUMED.....ORIG

BUSHIPS.....

C O N F I D E N T I A L

082128Z

SECRET

FROM: CWSF
TO: BUMED 151807Z

REFURDIS 082130 X BOARD RECOGNIZES DESIRABILITY OF ONE SET OF STANDARDS FOR ALL SHIPS X CATEGORIES SET UP IN ATTEMPT EARLY RELEASE ACTIVE SHIPS FOR OPERATIONAL PURPOSES WITH PROVISIO THAT DISPOSAL STANDARDS WOULD BE MET AT LATER DATE IF REQUIRED X AMOUNT OF ACTIVITY ALLOWABLE FOR OPERATIONAL PURPOSES MUCH GREATER THAN SHIPS FOR SCRAP X ADEQUATE METHODS AVAILABLE TO REACH READINGS OF POINT ZERO ZERO ONE SHIELDED AND POINT ZERO ZERO FIVE UNSHIELDED X POINT ZERO TWO AVERAGE HULL READINGS DRY WITH SELF ABSORPTION DIFFERENTIAL THIRTY PERCENT X THIS MEANS HULL WITHOUT HAZARD AND SATISFYING FINAL CLEARANCE REQUIREMENTS X QUESTION E MEASUREMENTS TAKEN INSIDE SHIELDED X DOCKING DEPENDENT ON STATISTICAL AVERAGE WHEN SYSTEMATICALLY MONITORED READINGS COMPLY WITH ABOVE STANDARDS ON PORTIONS OF UNDERWATER BODY EXPOSED BY LISTING AND TRIMMING TO MAXIMUM PRACTICABLE EXTENT X

151807Z Nov.

CONFIDENTIAL

SECRET

Page 90

U 32602

COPY

FROM: BUSHIPS-BUMED
TO: RADSAFE HDQ NAVSHIPYD SAN FRAN
INFO: COMWESSEAFRON

111605Z

PLEASE PASS TO CAPT WALSH X REQUEST CONFIRMATION OF
ADVISORY BOARD DECISION THAT ANCHOR CHAINS ANCHORS
AND CHAIN LOCKERS HAVE SAME LIMITS FOR FINAL CLEAR-
ANCE AS UNDERWATER BODY OF SHIPS HULL X

SECRET

C O P Y

WN9

SN C133

2-2-2

D D D

WNNA WNDE V SNC NR B55/ 9 D

FM COMWESTSEAFRON 091907Z
TO BUMED/WNNA

INFO BUSHIPS/WNDE

YOUR 051942Z OPINION OF BOARD LESS NEWELL X SMALL BOAT
HULLS SAME FIGURES AS SHIPS HULL X ENGINES SAME FIGURES
AS SALT WATER SYSTEMS X HULL AREAS MAY BE COVERED WITH
MULTIPLE COATS OF ENAMEL OR SIMILAR RESINOUS PAINT

2140/9 DEC UG 091907Z 051942Z

SECRET

Page 92

21 1957

C O P Y

FROM: COMWESSEAFRON

TO: BUMED

12 NOV 1946

INFO: BUSHIPS

111917Z

NCR 4830

BOARD RECOMMENDATION MAXIMUM DRY READING .02 COMBINED BETA AND GAMMA ON HULL FOR DISPOSAL VESSELS. YOUR 082128. STATISTICAL AVERAGE READINGS WERE NOT CONSIDERED ACCEPTABLE ALTHOUGH BOARD AGREED TO ACCEPT 1 LOCALIZED AREA IN EXCESS OF ABOVE LIMIT BUT EACH CASE SHOULD BE SETTLED ON ITS OWN MERITS BY BUMED. PUGET SOUND SPDLTRS 0770 AND 0775 NOT HELD. YOUR 082130. QUESTION B. DRY READINGS. HULL WITHOUT HAZARD AND SATISFIES FINAL CLEARANCE REQUIREMENTS. QUESTION E. MEASUREMENTS INSIDE SHIP SHIELDED. AMPLIFYING DESPATCH FOLLOWS TOMORROW.

C O N F I D E N T I A L

111917Z

SECRET

C O P Y

Un155

SN165

DEC. 12

2-2-2

R R R

WNDE R

SNFH D V SNC NR 148/12 R

FM COMWESTSEAFRON 121907Z
TO BUSHIPS CODE 180-A R/WNDE

INFO RADSAFE HDQTRS NAVAL SHIPYARD SANFRAN D/SNFH

RESTRICTED X THIS CONFIRMS ADVISORY BOARD DECISION THAT
ANCHOR CHAINS ANCHORS AND CHAIN LOCKERS HAVE SAME LIMITS
FOR FINAL CLEARANCE AS UNDERWATER BODY OF SHIPS HULL X
THIS INFORMATION INADVERTENTLY OMITTED FROM PREVIOUS
DESPATCHES AND WRITTEN RECOMMENDATIONS

1907/12 DEC FV 121907Z

SECRET

COPY

P P P

SNC V WNNR NR 16 P

FM BUMED 252116Z

TO COM 12

ATTN CAPT W E WALSH MC USN X SPECIAL MEDICAL ADVISORY BOARD TO BE FORMALLY ORGANIZED IN ACCORDANCE WITH MEMORANDUM OF CAPT LYON TO CAPT WALSH RELATIVE THERETO X PRESENT REQUESTS TO BOARD IN WRITING FOR THEIR CONSIDERATION AND RECOMMENDATION TO CHBUMED VIA CAPT WALSH X PRESENT TO BOARD FOR FORMAL CONSIDERATION AND RECOMMENDATION SPECIFIC PROBLEMS SUCH AS X ABLE X RAISING FINAL CLEARANCE SHIELDED READINGS TO POINT ZERO ONE AND UNSHIELDED POINT ZERO FIVE MAXIMUM ANY PLACE X BAKER X VARIABILITY AND PROBABLE UNRELIABILITY XRAY TWO SIX THREE BELOW POINT ZERO ONE WITH SUBSTITUTION LOWER READINGS EARPHONE COUNT AS TO BACKGROUND OR NUMBER OF TIMES BACKGROUND FOUND X CHARLIE X PROBLEM ALL SHIP BELOW ACCEPTED TOLERANCE FINAL CLEARANCE EXCEPT ONE LOCALIZED FLAT SURFACE ON HULL ABOVE POINT ONE X DOG X SAME EXCEPT IT BE ONLY ONE SECTION PIPE OR ONE EVAPORATOR ABOVE FINAL CLEARANCE TOLERANCE X THESE AND MANY OTHER BOTTLE NECK PROBLEMS TO BE PRESENTED FOR THEIR CONSIDERATION AND RECOMMENDATION X MUST BE A COLLECTIVE OPINION NOT INDIVIDUAL X INCLUDE ON BOARD WALSH MORTON SCOTT HAMILTON RODENBAUGH NEWELL AND WHEN AVAILABLE LANGHAM AND WARREN X LANGHAM AVAILABLE FOR MEETINGS ON REQUEST X COLONEL WARREN CONCURS IN PLAN X SIMILARLY PRESENT TO BOARD PROBLEMS AND VIEWPOINTS SO WELL SET FORTH IN BARNES TWENTY THREE OCT TO CAPT LYON X SCHNEIDER TO UNDERSTUDY WALSH IN PREPARATION HIS PROBLEMS ON TARVES AND RELIEVE WALSH EVENTUALLY X WALSH CONCENTRATE ON PUSHING ACTIONS OF BOARD X THIS OUR MOST CRITICAL PROBLEM X REQUEST WULFMAN BE RETURNED TO BUMED BY FIFTEEN NOV TO ASSIST IN RADIOLOGICAL SAFETY SCHOOL FOR MEDICAL OFFICERS BEGINNING FIFTEEN NOV X THIS DISPATCH YOUR AUTHORITY APPROACH ADVISERS TO BE KNOWN AS SPECIAL MEDICAL ADVISORY BOARD TO CHBUMED X

SECRET

LTRS TO BE SENT TO EACH INDIVIDUAL AS SOON AS POSSIBLE
X MEDICAL MONITORS EXCEPTING HARRIS TO BE RETAINED IN
RADIOLOGICAL SAFETY WORK UNTIL ONE JAN AND THEN RE-
LIEVED THIS DUTY X RECOMMEND BARNES RELIEVE WULFMAN
IF MEDICAL OFFICER REQUIRED AFTER WULFMAN LEAVES X
MEDICAL OFFICERS WITH RADSAFE TRAINING AVAILABLE BY ONE
JAN
2116/25 OCT VD 242116Z

SECRET

STATISTICALLY DERIVED AS POSSIBLE WITH NO SINGLE AREA
OVER .05 IN ATTEMPT TO GET AT QUANTITATIVE ASPECT OF
CONTAMINATED MATERIAL PRESENT. ANSWER. MORE EX-
PERIENCE REQUIRED TO CORRELATE INTERNAL AND EXTERNAL
READINGS.

BUMED - ACT
414

CONFIDENTIAL

SECRET

FROM: COMWESSEAFRON

FOR ACTION: CHBUMED

DATE 6 Nov. 1946

TOR CODE ROOM 1146/06

DECODED BY BUCKLEY

TYPED BY ROBERTS

060145Z NCR 4371

CONFERENCE HELD 4 NOV WITH NEWELL RODENBAUGH, HAMILTON, SCOTT, MORTON. QUESTION (A) RAISING OF FINAL CLEARANCE OF SHIELDED READINGS TO .01 ANSWER SHIELDED ACTIVE SHIPS .01 GAMMA. SHIELDED INACTIVE AND DISPOSAL SHIPS .001 GAMMA. B. QUESTION RAISING OF FINAL CLEARANCE OF UNSHIELDED READINGS TO .05 MAXIMUM ANY PLACE. ANSWER. ACTIVE SHIPS .05 BETA PLUS GAMMA. INACTIVE AND DISPOSAL SHIPS .005 EXCEPT .02 ON HULL. C. VARIABILITY AND UNRELIABILITY OF X 263 BELOW .01 WITH SUBSTITUTION LOWER READINGS EARPHONE COUNT AS TO BACKGROUND OR NUMBER OF TIMES BACKGROUND FOUND; DISCUSSED AT LENGTH WITH CONCLUSION THAT 263 IS UNSATISFACTORY BUT BEST AVAILABLE INSTRUMENT AT PRESENT KNOWN RADIUM SOURCES FOR COMPARISON SHOULD BE PROVIDED WHICH SHOULD ENABLE MONITOR TO DETECT .001. D. PROCEDURE WHEN READINGS BELOW TOLERANCE FOR FINAL CLEARANCE EXCEPT ONE LOCALIZED FLAT SURFACE ON HULL. ANSWER. EACH CASE MUST BE INDIVIDUALLY SETTLED CONSIDERING SIZE OF AREA INVOLVED AND MAGNITUDE OF DECONTAMINATION REQUIRED. E. SAME QUESTION EXCEPT ON SECTION OF PIPE OR EVAPORATOR. CLEAN TO BELOW TOLERANCE EXCEPT INTAKE OR OVERBOARD DISCHARGE OUTBOARD OF VALVE TO BE CONSIDERED AS PART OF HULL. F. QUESTION. ASSUMING THAT ROCKBRIDGE UNDERWATER HULL REPRESENTATIVE OF WORST TYPE SHIP ENCOUNTERED WILL DOCKING BE REQUIRED PRIOR TO CLEARANCE. ANSWER. SHIPS PRIOR TO DISPOSAL MUST MEET STANDARDS RECOMMENDED. G. QUESTION. OPINION AS TO RELIABILITY OF WATER LINE READINGS AS INDEX OF UNDERWATER BODY CONTAMINATION. ANSWER. NO VALUE. MAY BE OF VALUE IF SHIPS HEELLED OVER FOR READINGS. RECOMMEND ATTEMPT BE MADE TO CORRELATE INTERNAL AND EXTERNAL READINGS AS MORE SHIPS ARE DOCKED. H. OPINION AS TO ESTABLISHING POLICY OF NOT REQUIRING DRYDOCKING FOR ANY SHIP IF HULL READINGS ARE BELOW .05. ANSWER. ACTIVE SHIPS .05 INACTIVE .02. I. OPINION OF BOARD AS TO ACCEPTANCE AVERAGE READINGS OF .005 SHIELDED AS NEARLY

SECRET

COPY

FROM: BUMED

TO: COMWESSEAFRON

RELEASED BY: CAPT G M LYON

INFO: BUSHIPS

5 DEC 46

COMNAVBASE TERM IS
MED SEC RADSAFELAB
HUNTERS POINT CALIF

051942Z

NCR 1217

ATTN COMMANDER HOFFMAN REF COMNAVBASE TERM
RESTRICTED DISPATCH 280231Z NOV. PASS TO COMMANDER
HOFFMAN. REQUEST YOU ASK WALSH TAKE UP WITH MEDI-
CAL ADVISORY BOARD PROBLEM CLEARANCE SMALL BOATS
IN LINE WITH WINNS REQUEST OF STATEMENT. HIS DESPATCH
GIVES INFORMATION AS TO MAXIMUM READING ONLY AND NO
BASIS FOR EVALUATING QUANTITY RELATIONSHIP. BUMED
CANNOT CONCUR IN SMALL BOAT CLEARANCE UNTIL PROBLEM
CONSIDERED BY MEDICAL ADVISORY BOARD WITH SUITABLE RE-
COMMENDATIONS WHICH TAKE INTO CONSIDERATION ULTIMATE
DISPOSAL SUCH BOATS. NECESSARY THEY ESTABLISH CRITERIA
FOR OPERATIONAL CLEARANCE AND FOR FINAL CLEARANCE.
HULLS AND ENGINES TO BE CONSIDERED SEPARATELY AND
SEPARATE CRITERIA ESTABLISHED.

BUMEDORIG

BUSHIPS414...OP04

PRIORITY

CONFIDENTIAL

051942Z

SECRET

COPY

C O N F I D E N T I A L

FROM: COMWESSEAFRON

TO: BUMED

13 NOVEMBER 1946

INFO: BUSHIPS

130127Z

NCR 4917

CANCEL MY 111917. BOARD RECOMMENDS STATISTICAL AVERAGE HULL READINGS WHEN SYSTEMATICALLY MONITORED OF .02 COMBINED BETA AND GAMMA DRY OR .014 WET FOR DISPOSAL AND INACTIVE. .1 BETA AND GAMMA AS MAXIMUM ALLOWABLE FOR ANY ONE ISOLATED AREA EXPLAINED BY COMDR FEE AND IS ACCEPTABLE. QUESTION B. .02 DRY OR .014 WET MEANS HULL WITHOUT HAZARD AND SATISFIES FINAL CLEARANCE REQUIREMENTS. QUESTION E. MEASUREMENTS INSIDE SHIP AND SHIELDED SUCH AS TAKEN ON SECTION OF PIPE BETWEEN SKIN OF SHIP AND INBOARD VALVE. REF PUGET SOUND SPDLTRS 0770 and 0775. SYLVANIA, WHARTON RECLAIMER BAYFIELD AND POLLUX WITHIN ABOVE LIMITS AND DO NOT REQUIRE DRYDOCKING. WALSH CONFERRING ON ADDITIONAL QUESTIONS.

BUMED ACTION

BUSHIPS

130127Z

SECRET

C O N F I D E N T I A L

FROM: BUMED

TO: COMWESSEAFRON

9 NOV. 1946

082130Z

NCR 590

ATTN CAPT W E WALSH (MC)

REURDES 060145Z. REQUEST BOARD PROVIDE JUSTIFICATION FOR 2 STANDARDS FINAL CLEARANCE (A) ACTIVE AND (B) INACTIVE OR DISPOSAL WHEN ALL ARE POTENTIALLY OF LATER CLASSIFICATION. BUMED RECOGNIZED FINAL CLEARANCE AS MEANING NO POSSIBLE HAZARD SUBSEQUENT TO GRANTING FINAL CLEARANCE REGARDLESS OF WHAT DONE TO SHIP. BUMED RECOGNIZES FINAL CLEARANCE FOR ANY SHIP BE BASED ON SHIELDED READING .001 AND UNSHIELDED .005. CLARIFY YOUR ANSWER QUESTION B "EXCEPT .02 ON HULL. DOES THIS MEAN WET OR DRY. DOES THIS MEAN HULL CONSIDERED WITHOUT HAZARD AND THEREFORE SATISFYING FINAL CLEARANCE REQUIREMENTS. ALSO YOUR ANSWER E DOES INTAKE OR OVERBOARD DISCHARGE CONSIDERED AS CONSIDERED HAVE MEASUREMENTS TAKEN FROM OUTSIDE SHIP UNSHIELDED OR INSIDE SHIP SHIELDED. CAN WE ASSUME BOARDS APPROVAL NOT DOCKING FOR RADIOLOGICAL PURPOSES SHIPS WITH HULL READINGS MAXIMUM ANY PLACE OR DOES THIS MEAN STATISTICAL AVERAGE WHEN SYSTEMATICALLY MONITORED ARE HULL READINGS INDICATED AS WET OR DRY. REQUEST MORTON PREPARE AND FORWARD AIRMAIL REPORT OF MEETING. DISPATCHES TOO BRIEF AND LEAVE TOO MANY OPPORTUNITIES FOR CONFUSION

SECOND COPY TO BUMED2100/13 MAR 47

ADD BUSHIPSPER BUMED 2100/13 MAR 47

BUMEDORIG

082130Z

CONFIDENTIAL

SECRET

Code 180 A
All/Crossroads/S99

NAVY DEPARTMENT
Bureau of Ships
Washington 25, D.C.

S-E-C-R-E-T

10 December 1946

M E M O R A N D U M

Subject: Conference on Radiological Safety; Report of.

Time: 0910, 27 November 1946.

Place: Navy Department, Bureau of Ships Room T3-2703.

Present: R.Adm. SOLBERG (BuShips) Col. NICHOLS (ManhatDist)
Capt. MAXWELL (BuShips) Col. ROPER (ManhatDist)
Cdr. FEE (BuShips) Col. FIELDS (ManhatDist)
Cdr. HOFFMAN (BuShips) Col. COONEY (RadSafe)
WesCoRep.) Capt. LYON (BuMed)
Cdr. LANGER (BuShips) Dr. HAMILTON (Univ. Calif)
Cdr. HAWES (BuShips)

1. Admiral Solberg opened the conference by stating that radiological decontamination of Bikini non-target ships is now proceeding satisfactorily on the West Coast. About 90% of the vessels are expected to have final radiological clearance by 20 December. In the early stages many of the Commanding Officers were very much concerned over the suspected radioactivity hazards on the ships. They were also somewhat reluctant about prosecuting the decontamination vigorously. However, they have finally been convinced of the necessity for constant application until final clearance has been obtained. A new directive has now been issued by BuShips and BuMed covering the complete field of radiological decontamination. This directive had been read and approved by Dr. HAMILTON and Colonel COONEY. The new directive should stand as written for some time with the possible exception of a change in the hydrochloric acid solution used.

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2. Dr. HAMILTON reported that a new solution for decontaminating salt water systems is now under investigation. The new solution contains a mixture of hydrochloric and citric acids and under laboratory conditions removes 98-99% of the radioactive products. Dr. HAMILTON pointed out that this solution may be very important at some future date when very much larger quantities of fission products might require handling and the difference of a few percent would be critical. He did emphasize, however, that the problem of removing radioactive materials from the non-target ships at the present time is very much more difficult than would have been the case if they had been treated within a week or two after contamination. This is true because of the deposit of layers of other material over the original radioactive matter and also the diffusion of the fission products which has taken place over the period of time since the exposure. Dr. HAMILTON also stated that he is fully aware of the fact that prosecution of decontamination processes in the laboratory is a much more simple matter than on board ships. For this reason he is very happy about the controlled decontamination which is being carried out on the ACHOMAWI and LST 881.

3. Admiral SOLBERG stated that he understood that the new solution of hydrochloric and citric acids was being tried on the CEBU and would like more information as to the details of the new mixture. He was advised that the solution acts more rapidly than one normal hydrochloric acid with a vigorous evolution of gas. It is actually one-half normal hydrochloric acid solution with an original Ph of a little less than that of one-half normal hydrochloric acid, perhaps 3 or 4. The first vapor given off is carbon dioxide resulting from reaction with calcareous materials. It is easier to handle and less dangerous than one normal hydrochloric acid solution. It is non-poisonous at all times and is not injurious to the human body with the exception of the eyes. It reacts on steel very slowly, but the only location in pipe systems where the effect might be noticeable at all would be on valve seats where perhaps a few ten-thousandths of an inch might be lost in the treatment. Admiral SOLBERG believed that one normal hydrochloric acid might still be quicker in removing heavy scale deposits as in evaporators. Dr. HAMILTON stated that the new mixture is better on general scale

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attack than is one normal hydrochloric acid although the new solution has not yet been tried on evaporator scale which is very dense and more difficult to attack than marine growth in pipes. Dr. HAMILTON agreed that the combination hydrochloric and citric acids should be tried on evaporators. Dr. HAMILTON reported also that a laboratory counter about one hundred times more sensitive than the X-263 has been set up for making a careful determination of the extent to which the radioactive materials can be removed with the new solution. Admiral SOLBERG voiced the opinion that perhaps the best treatment to settle on finally, might be use of one normal hydrochloric acid on evaporators to remove the heavy scale followed by a treatment with the new mixture to remove the remnant. He suggested trying this treatment on some ships with heavily scaled evaporators.

4. Admiral SOLBERG suggested that some fission products be left in a few salt water systems of selected active ships. Under this arrangement these ships would be retained in an operational clearance status over a considerable period for the purposes of study by sampling every six months to determine whether the erosive effects of the water circulation will act to remove the fission products. Dr. HAMILTON suggested, along this line, that samples of pipe sections be taken now on these ships and photofilm studies of the samples be made. The process should be repeated in six months by removing a section of pipe adjacent to the original sample for comparison and examination of the removal, diffusion or covering up of the radioactive materials. Captain LYON advised that this had in effect been started on the BURLESON by running alpha counts on scale, but the samples were too weak showing no alpha in twenty-four hours but definitely showing the presence of plutonium on a 30 day test.

5. Admiral SOLBERG mentioned the desirability of investigating wood samples and painted surfaces, also, to study the behavior of fission products present and the possibility of migration of the material over a long period of time. Dr. LYON stated that a man is available in the Public Health Service to make the necessary examination of samples. Dr. HAMILTON stated that he is familiar with the work of this man who has not had experience in making radioautographs. It was suggested that the man be sent to University of California for a short period of training in the laboratory and then returned

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to his own laboratory to carry on the necessary work which will require only part time. It is highly desirable that the work not be done at University of California because of the crowded conditions there. The man in question is of Turkish origin, but is an American citizen, and has great abilities. Col. FIELDS stated that he could be granted necessary clearance for the work at Berkeley.

6. Admiral SOLBERG believes that immediate and careful consideration should be given to the decontamination program to insure that valuable information and opportunities for research will not be destroyed in the haste to obtain radiological clearance on all non-target ships as soon as possible. He stated that studies of salt water systems can still be made on some of the target ships which had diesel generators operating and used portions of firemain in a highly contaminated part of the lagoon subsequent to Test BAKER. Examples of such ships are PENSACOLA, SALT LAKE CITY, NEW YORK and NEVADE. He also cited the fact that entire sections of contaminated piping systems could be removed from these targets and reinstalled in active ships for experimental purposes. The PRINZ EUGEN and NEW YORK will also offer excellent samples of contaminated wood decks, while these and other target ships will yield good painted surfaces for migration studies.

7. Another problem brought forth by Admiral SOLBERG was that of the four submarines, PARCHE, SEARAVEN, DENTUDA and TUNA now at Mare Island and only negligibly damaged. There is a possibility of a saving in funds if these vessels can be put in satisfactory use for reserve training cruises. If this action were taken, these vessels also would present excellent cases for study. The recent program of decontamination has been based on clearing non-target ships as soon as possible and waiting for the return of targets before initiating extensive decontamination research. However, the four submarines mentioned provide an immediate field for such studies. A wash of the new hydrochloric-citric acid solution might be tried. All known means of decontaminating these vessels were tried at Bikini, but they still remained above operational clearance limits as now established. Upon arrival at Mare Island the readings were in general within tolerance levels on the topside but with a few high spots. All had been painted over. Dr. HAMILTON noted that when painted over, the plutonium does not present a hazard. He also stated that the present gamma radiation is from

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zirconium and columbium and even if as high as 5 R/day will be safe within four months. It was agreed that the four submarines may be of some value in the investigation fields, but not nearly so much as active ships which still have parts contaminated.

8. The question of treatment of work decks was raised. Dr. HAMILTON stated that there is no known method of handling radiological contamination of wood decking other than removing and disposing of it. He did reiterate, however, that investigation of the effect of various solutions on the contaminated wood should be made and the migration of the fission products under treatment should be studied by use of radioautographs. Furthermore, he believed that an attempt should be made to determine whether the contamination before treatment is located only on the surface or permeates the material. Admiral SOLBERG stated that if the radioactive materials are only on the surface treatment with a liquid will probably carry it further in. Commander HOFFMAN reported that experience at Bikini in planing contaminated wood decks showed that the activity extended through a layer at least 3/16" thick. Dr. HAMILTON advised that a few samples of wood deck be obtained and checked to study this matter. It was reported that some samples of wood deck as well as steel plate specimens are now at Hunters Point, but no investigation work has progressed on these, as yet. There are also some samples at Los Alamos on which very little has been accomplished according to Col. COONEY. Admiral SOLBERG reported that he has received no reports on the Los Alamos samples.

9. Dr. HAMILTON reported that Drs. MORTON and MORRISON have been of invaluable assistance at Berkeley and have been carrying the brunt of the Navy's radiological investigation work at the University of California. Dr. HAMILTON also expressed the desire to have two other naval officers replace MORTON and MORRISON at the University when the latter shift to the Hunters Point Laboratory. Admiral SOLBERG said that he wanted to relieve the University of California of as much of the actual work as possible while still obtaining their advice in the operation of the Hunters Point Laboratory. He definitely does not want to lose the relations with the Crocker Laboratory just because the Navy is setting up its own laboratory. Commander HOFFMAN reported that several of the monitors are very much interested in radiological investigation work and two are actually working in the Hunters Point Laboratory.

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When the clearing of the non-target ships has been completed it is possible that these two monitors might go to Berkeley. In response to a question from Captain LYON, Admiral SOLBERG reported that BuShips expects to train radiochemists for its phase of the work just as BuMed is training them for biochemical research. Dr. HAMILTON considered that BuShips will have need for a greater number of trained radiochemists than BuMed will. He further mentioned that the physical part of the work was simple and that the chemical was by far the most important. Captain LYON advised that Drs. MORTON and MORRISON will be utilized in the future as biochemical radiochemists in assessing health hazards and establishing radiological tolerances and limits. Dr. HAMILTON believes that at least one of the replacements for Drs. MORTON and MORRISON should be a BuShips officer. Captain MAXWELL advised that a Lt. PRESTON, who has a Ph.D. in chemistry from the University of California, and is now engaged in petroleum research in BuShips, will be available for radiological work on 2 December and can go to Berkeley if desired.

10. Col. COONEY advised that Col. NICHOLS would arrive at the conference about 1000 and desired to discuss the security aspect of radiological decontamination. Admiral SOLBERG said that preliminary discussion should be undertaken prior to Col. NICHOLS arrival to save time. The Admiral presented as the most pressing question of security that relating to drydocking and the disposal of marine growth and sand-blasting sand from contaminated ships. Dr. HAMILTON stated that the quantities of sand involved were so immense and the amounts of plutonium so small from any ship that the dilution of the radioactive material was sufficient to render it impossible for anyone to obtain any information from the sand. He said, the sand could safely be used for paving or construction. He was advised, however, that the sand is not suitable for construction and is used generally only for fill. Admiral SOLBERG pointed out that Col. WARREN had been worried about dumping the sand at high places because of the possibility of contaminating water supplies. Dr. HAMILTON refuted this point by inviting attention to the fact that all water soluble materials would have left the ship's bottom prior to docking, hence no concern as to disposition of the sand should arise provided ship's bottoms were no more than 3 to 4 times as active as the ROCKBRIDGE.

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The recommendation was, therefore, that no special disposal of sand from non-target vessels was necessary. Marine growth on vessels not radiologically cleared should be disposed of by sinking at sea, however, since 30 to 40 lbs. of dry algae would offer good possibilities for radiochemical analysis. Target vessels with 4-20 R/day would give rise to concern over sand disposal. Admiral SOLBERG advised, however, that it was at present not contemplated that any cleaning of target ship bottoms would be undertaken except for scraping of small areas to conduct structural examinations. He further stated that the present plan is not to sell targets for scrap and the probable final disposition will be sinking. No problem of disposal of material in docks will arise because the targets will remain for only short periods, perhaps three or four days, during which practically no marine growth will fall off. No docking hazard is likely to arise since the target ship bottoms are not particularly radioactive. The SKATE, when docked in Mare Island, had readings varying from .05 to .3 R/day. The HUGHES was docked at Bikini with no danger, and particular attention was given to the condition of the bottom to determine what hazard might be expected from this source. Admiral SOLBERG attributes the low concentration of fission products on the underwater bodies to the plastic paint which apparently does not absorb the active products. Further, most of the targets will have been lying in Kwajalein for a considerable period, during which much of the activity will have been rejected by exfoliation, and much more will be washed off during the long return trip. Hence it is not likely that any problem will arise as a result of radioactivity on target ship bottoms.

11. With respect to disposal of acid solutions used in cleaning salt water systems, Dr. HAMILTON believes that quantities up to one curie of fission products can be dumped into a harbor in a six months period without hazard. In most cases the material will settle into the mud where it will do no harm and the dilution factor in a large harbor such as at Puget Sound or San Francisco is so great that no concern need be experienced. Another reason for not being alarmed about discharging the used acid solution into harbors is the fact that a large number of the non-target vessels will not be accomplishing the operation in the same locality simultaneously. Dr. HAMILTON was certain that the dumping

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of used acid solutions from an average of not more than one vessel per week in one geographical location would be perfectly safe. Capt. LYON advised the conference that Col. WARREN had been of the opinion that not more than five vessels should be permitted to dump acid solutions used in removing radioactivity concurrently in one harbor. Dr. HAMILTON advised that consideration be given to the public relations angle in not permitting the information to leak out regarding the local disposal of acid and sand containing some fission products in spite of the fact that the quantities involved entail absolutely no health or security hazard. Adm. SOLBERG stated that in view of the progress already made in the decontamination program the Navy could probably continue to dump the acid solutions at sea but would benefit greatly by elimination of the need for special disposal of the sand. Dr. HAMILTON agreed but advised that if the sand should leave Navy property, the persons receiving it not be advised of the source because of their likely failure to understand that no hazard from radioactive materials existed.

12. Dr. HAMILTON stated that the principal security problem lies in disposal of Bikini ships for scrap. He definitely considered the new directive absolutely safe with respect to limits for radiological clearance. He went on to explain that the plutonium in a ship, which may be several hundred micrograms, is mixed intimately with so tremendous a gross quantity of rust and scale that the cyclotron would be a much more efficient means of obtaining the element. As to determining the efficiency of the bomb from the fission products present, Dr. HAMILTON believes these ships would be very poor because of the change in characteristics of the deposits as a result of the cleaning solutions used on interior systems, and the erosion and exfoliation on the underwater bodies with time of immersion. In fact, he said, the desert sands at Alamogordo provide a much better source for bomb efficiency analysis.

13. At 1010, Col. NICHOLS and Col. ROPER joined the conference. Admiral SOLBERG summarized for the new conferees the conclusions on security which had thus far been reached in the conference as follows;

(a) There is considered to be no problem of security requiring disposal of sand used in sand-blasting non-target vessels. The marine growth removed should, however, be disposed of by sinking at sea.

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(b) It is also considered unnecessary to make special disposition of solutions used for cleaning ships' salt water systems, but for the present the existing practice of dumping at sea will be followed.

Admiral SOLBERG went on to explain that it is highly desirable, if possible, to avoid special drydocking of non-target vessels before disposal. Since the period elapsing between the present time and the actual disposal of such vessels by the Maritime Commission will be more than a year, no hazard from radioactive materials is deemed to exist.

14. Dr. HAMILTON explained that two principal considerations had governed his conclusions in security matters.

(a) Source of plutonium. After decontamination to established limits, perhaps 100 micrograms of plutonium remain in hundreds of thousands of feet of pipe mixed with thousands of pounds of scale, rust, and the like. To separate out the plutonium from this gross material would be a tremendous job. On the other hand, a small cyclotron could easily produce a milligram of plutonium in a year. Consequently, the ships are considered to represent no security hazard from the source of plutonium standpoint.

(b) Bomb efficiency. The amount of fission products obtained from kilograms of contaminated material on a ship would be very small and most unreliable because of selective leaching and solution selection on cleaning of systems. The best source of samples of products would be underwater body plates, but even in that case with as much as tens of kilograms of scrapings, there is no probability of obtaining a reliable estimate of efficiency. Dr. HAMILTON was positive of the uselessness of samples of material from salt water systems which had been acid cleaned, but said the underwater hull was not necessarily subject to the same disproportionation.

Admiral SOLBERG, however, believes that the exfoliation on the underwater body upsets the proportions of materials present. Dr. HAMILTON suggested that some hull samples be tested at University of California to check this point. If the materials reveal the possibility of a risk involved, the matter will be reviewed. If not, as anticipated, and it is as difficult as believed to run an assay, the entire matter can be dismissed.

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as no security concern. Meanwhile, Col. NICHOLS agreed that special docking for non-target decontamination will be dispensed with until and unless Dr. HAMILTON's investigations indicate the contrary to be necessary. With respect to target vessels the present plan is not to sell or scrap, hence they do not enter this problem at the moment. Captain MAXWELL pointed out that several ex-targets are now at Norfolk and with the cancellation of the special tests for which they were earmarked are now preparing for routine disposal. Captain LYON pointed out, however, that these particular vessels are to be excluded from all target vessel considerations and are to be regarded as non-targets from the standpoint of decontamination.

15. Admiral SOLBERG stated his desire to have bomb efficiency assays conducted on samples from several locations on returning target vessels. Dr. HAMILTON believes six representative samples will be sufficient to provide the necessary information. He also believes that the plate samples now available from target vessels may be satisfactory for the purpose. Col. ROPER stated that perhaps the Maritime Commission should be advised to hold back any Bikini vessels turned over for disposal until Dr. HAMILTON's assays are completed. Dr. HAMILTON expressed the belief, however, that any special considerations requested would arouse undue suspicion as to the safety of handling the ships. Col. NICHOLS rendered the decision that the program of disposal will proceed normally as already decided, keeping a record of which vessels having been exposed are turned over for disposal, and the Navy will step in when and if it becomes necessary as a result of the bomb efficiency assay.

16. Dr. HAMILTON advised that there need be no concern over melting down scrap from the non-target ships. The only point to be considered in this respect is the possibility of using this means to determine the bomb efficiency. To do this would require separating out one of the fission products which is an extremely difficult operation. At present the only products which still lend themselves to separation are the long life cerium or europium. Col. NICHOLS decided that in this case, also, the only special precaution would be to keep a record of which ships are involved until Dr. HAMILTON completes his bomb efficiency investigations.

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17. Dr. HAMILTON raised the question of the possibility of unauthorized persons entering Bikini Lagoon and obtaining samples for efficiency analysis. Admiral SOLBERG advised that no one is on the islands, the lagoon is a closed port and periodic flights are made from Kwajalein to insure that unauthorized entries are not made. It was admitted that there would be considerable difficulty in obtaining samples but some of the sand in the lagoon is still at 50 R/day. Dr. HAMILTON stated that only a small sample would be required and could be located by means of any ordinary geiger counter. He also noted as significant the fact that several foreign nations had ordered counters from this country. The possibility of disproportionation of fission products by plant and animal life present was raised. Dr. HAMILTON responded that there might be some but it would be insignificant. He suggested that to verify this statement and to check the hazard to security represented by Bikini, some samples of sand be obtained for assay if Col. NICHOLS desires. Col. NICHOLS stated he would like to have this done if it could be accomplished without undue difficulty. Admiral SOLBERG recommended that arrangements be made to have Captain DRAEGER contact Atoll Commander Kwajalein with respect to obtaining the necessary sand samples from Bikini.

18. Col. NICHOLS raised the question as to whether there was any possibility of successful suits against the government by agencies receiving the non-target ships for scrap. Dr. HAMILTON, in response, stated that no such possibility existed because of the small quantities of fission products which would be present in the scrap. He did say that there would probably be many suits by cranks, but none of these would be valid, and it would be foolish to try to work towards avoiding them. Col. FIELDS said that Gen. GROVES is very much afraid of claims being instituted by men who participated in the Bikini tests. Dr. HAMILTON said in response to this possibility, that there is much authoritative information available to prove that plutonium in the form contained in the bomb is not absorbed by the digestive tract or through the lungs unless quantities as large as a gram are being dealt with. He also believes that the health hazards from long life fission products are far greater than from plutonium. These fission products are strontium and cerium which are very rare, however. Furthermore, plutonium in the form being dealt with does not go to the skeleton which is the principal danger of the strontium and cerium. The

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amounts of dangerous fission products to be found in the scrap would be on the order of 50 millicuries, in tons of slag where it would be found. This quantity is on the order of the amounts of radium found in ordinary rock. Therefore, Dr. HAMILTON is willing to state positively that there is absolutely no possibility of physical injury from radioactive materials in the amounts which are being worked with on the non-targets under present conditions.

19. Dr. HAMILTON was very anxious to determine whether the present arrangements with University of California are satisfactory. Admiral SOLBERG stated that the Navy is highly pleased with developments and is completely open to suggestions and changes recommended by Dr. HAMILTON. Dr. HAMILTON said that he is interested in giving all the service he possibly can, and that all arrangements are completely satisfactory to him provided the Navy is getting all the information it needs.

20. Captain LYON raised the question of security of information in connection with the transfer of safety and decontamination functions to the Bureau of Medicine and Surgery and the Bureau of Ships. Captain LYON advised that a joint conference had considered that a section working directly under each Bureau Chief, preferably a small group with no intermediaries, should be charged with handling high security matters relating to radiological work. Col. NICHOLS advised that this matter will become a responsibility of the military liaison committee of the Atomic Energy Commission upon dissolution of the Manhattan District. Admiral SOLBERG advised that the Bureau of Ships is perfectly satisfied to permit his little group do whatever is required provided there is no undue interference with allocation of funds or operational schedules. Captain MAXWELL raised the question of clearance of civilian personnel who will be working in the new Radiological Laboratory. Col. FIELDS said that these people, if citizens, can be cleared very easily by Manhattan. Col. NICHOLS said he thought the clearance procedure should be maintained by the Atomic Energy Commission after Manhattan dissolves. Dr. HAMILTON said that if he can be advised of what personnel will be connected with the Hunters Point Laboratory and what their clearance status is, it will simplify his problem in determining how much information should be made available to each individual and he will be happy to supply it.

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21. Admiral SOLBERG advised that when the new laboratory gets into operation many security problems will be likely to arise in connection with personnel obtaining information on past procedures and reports of work accomplished. This information will be essential to avoid repetition and useless work. Commander HOFFMAN is very desirous of obtaining a copy of the Manhattan (University of Chicago) Handbook and Dr. SEABORG's lecture notes on nuclear chemistry to assist in establishing the laboratory. Dr. HAMILTON said that most of the Hunters Point problems will involve plutonium and fission product chemistry. If the personnel are cleared, Dr. HAMILTON will make the information available to them in the form of selected reports. Commander HAWES reminded Dr. HAMILTON that he had agreed to set up a list of the reports of this type which can be made available. Dr. HAMILTON said that the handbook would not be of much value in setting up the laboratory although portions of it might be useful in a general way. In any case, Dr. HAMILTON will provide information to Commander HOFFMAN as to what equipment is required.

22. Dr. HAMILTON advised that personnel were still very scarce in radiological work at Berkeley. He has recently been able to hire only one man on a part-time basis. The Manhattan District is having great difficulty maintaining sufficient personnel, also. Dr. HAMILTON has no promising students available at the moment for the new work, but expects to attempt to obtain additional graduate students for training. The new Hunters Point Laboratory is considered to be a very attractive spot for a young man who will be interested in a permanent, civil service job, and should bring forth some promising candidates. Dr. HAMILTON will confer with Commander HOFFMAN further in this matter at San Francisco.

23. At 1110 all Army personnel left the conference in order to take care of immediate business.

24. The remaining conferees continued the discussion of the security problem somewhat further. On the basis of the previous findings of the conference it was decided that considerable effort and expense could be saved by dumping into harbors rather than carrying to sea the acid solutions used in decontaminating salt water systems. It was therefore

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decided to permit activities to dump the acid into harbors slowly and preferably on an ebbtide. Dr. HAMILTON was requested to advise Col. NICHOLS of this decision.

25. With respect to provision of samples for the investigations to be conducted by Dr. HAMILTON on the possibility of determining therefrom the bomb efficiency, it was decided that Commander HOFFMAN would arrange to obtain the samples from docked ships on the West Coast. About five pounds of the sample materials are to be obtained from locations on the underwater bodies which monitor about .02 R/day (the present average clearance limit). The samples are to be marked in detail as to the locations from which they were taken and the radiation readings at those locations.

26. It was also decided that the use of the new combination hydrochloric and citric acid solution would be limited to the San Francisco area at the outset. Later Commander HOFFMAN may extend the use to Terminal Island and San Diego if he deems it appropriate and so desires.

27. The conference adjourned at 1145.

/s/ J. J. Fee

J. J. FEE

Commander, U.S. Navy

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All present at conference.

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APPENDIX VI
DIRECTIVES FOR FUTURE
DECONTAMINATION

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NAVY DEPARTMENT
BUREAU OF SHIPS
WASHINGTON 25, D. C.

Code 180

NY9-1

18 November 1946

AIRMAIL

CONFIDENTIAL

From: The Chief of Bureau of Ships.
To: Commander Naval Shipyard, San Francisco.
Subj: Laboratory for Radiological Studies; Supplement to
Present Laboratory Facilities for.
Ref: (a) CNO Conf. 1tr Ser 021P602 of 27 August 1946.
Encl: H.W.
(A) Copy of Ref (a).

1. Reference (a) established a radiological safety program for the Navy. The Bureau of Ships has been directed to: (a) Develop instruments for detection of radioactivity; (b) Develop equipment for protection of personnel on shipboard; and (c) Develop methods and equipment for decontamination of ships. One of the measures necessary to implement this program is the establishment of laboratory facilities for radiological investigations.

2. Present laboratory facilities at Naval Shipyard, San Francisco, shall be increased to carry out the above additional functions. Provision shall be made for estimation of radioactive contamination and development of methods and procedures for decontamination, studies of contamination by radioactive materials, and allied investigations. These facilities shall supplement, and cooperate with, activities of the Naval Establishment having direct cognizance of other phases of the radiological safety program.

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3. Installation of necessary equipment and facilities will be charged to Project Order 595/46 which is being increased by \$50,000, for this purpose. An itemized estimate of the cost of this work is requested. Maintenance and operation will be charged against a new Project Order, 286/47 in the amount of \$25,000, being issued. Estimates of these costs are also requested.
4. Naval Shipyard, San Francisco, will engage additional technical personnel; each person must be approved by the Bureau of Ships. Any increase in civilian personnel ceiling that becomes necessary shall be referred to the Bureau, Code 700. The Bureau will also request assignment of an officer to duty in the Shipyard as head of the new activities who will not be charged against the shipyard officer allocation.
5. The Bureau of Medicine and Surgery also will utilize the facilities of this laboratory for making studies of physical radiological hazards and such work in connection therewith as is associated with decontamination. That Bureau will provide officer personnel, equipment and supplies for work under its cognizance.
6. It is estimated that the services of seven technical men will be required immediately for work under Bureau of Ships cognizance. Several qualified personnel available to the Bureau of Ships can be assigned. Initial efforts of this group shall be directed toward solution of problems of decontamination of non-target CROSSROADS Ships. Work on similar problems for CROSSROADS target vessels will be undertaken when these vessels become available. It is expected now that these facilities will be utilized for a continuing research and development program.

cc:

CNO
CWSF
BuMed
ComServPac
Com 11th, 12th, 13th, 14th N.D.
BuY&D
BuAer
All West Coast Shipyards plus Pearl Harbor

C. D. WHEELOCK,
Rear Admiral, USN,
Deputy and Assistant
Chief of Bureau

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NAVY DEPARTMENT

OFFICE OF THE CHIEF OF NAVAL OPERATIONS.

OP-602/cmf
Serial: 021P602
(SC) S67-1

WASHINGTON 25, D. C.

CONFIDENTIAL

27 August 1946

From: The Chief of Naval Operations.
To: All Bureaus, Boards and Officers of the Navy
Department.
Subject: Establishment of a Radiological Safety Program
for the Navy.

1. In order to cope with the full implications of atomic warfare, and to discharge to the fullest extent the Naval responsibilities for the conduct of tests, experiments, and development in atomic weapons, including the completion of Naval aspects of Operation CROSS-ROADS, it is necessary that an organization and a program for radiological safety be established within the Navy with the least practicable delay.

2. The radiological safety program will involve procurement and training of personnel, design and procurement of instruments and special equipment, establishment of safety policies, standards, and regulations, research in decontamination procedures and physiological effects and their treatment, and other aspects peculiar to this safety hazard. It is desired that the organizational structure be laid down at an early date in order that the Bureaus and offices of the Navy Department may proceed along well defined lines of action in the discharge of their respective responsibilities.

3. The following general areas of cognizance and responsibility are hereby established:

Areas of Cognizance and Responsibility for Establishment and Execution of Radiological Safety Program.

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- (a) Establish policies with respect to:
 - (1) Organization.
 - (2) Equipment.
 - (3) Personnel qualifications, assignment, and training.
 - (4) Educational program for the Navy.
- (b) Coordinate Bureau activities.

BuMed

- (a) Establish safety tolerances and regulations.
- (b) Determine physiological effects and develop treatment methods.
- (c) Approve specifications for instruments to cover medical aspects.

BuShips

- (a) Develop and procure instruments for detection of radioactivity.
- (b) Develop and procure equipment for individual and collective protection of personnel on shipboard.
- (c) Develop methods and equipment for decontamination of ships.

BuPers

- (a) Establish training and educational program and conduct schools.
- (b) Establish and promulgate qualification standards of personnel assigned to Radiological Safety Program.

BuOrd, BuAer
BuSanda

- (a) Within their fields of cognizance set up coordinate and advisory activities to develop a well rounded decontamination and protection program for the Navy.

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BuDocks

- (a) Develop and procure equipment for collective protection of personnel ashore.
- (b) Develop methods and equipment for decontamination ashore.

s/s D. C. RAMSEY
Vice Chief of Naval Operations

AUTHENTICATED BY:

C. B. HART, Lt (jg) USNR (W)

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NAVY DEPARTMENT
BUREAU OF SHIPS,
WASHINGTON 25, D. C.

C-S93-(0) (689)

CONFIDENTIAL

14 January 1947.

To: Commander, Pearl Harbor Naval Shipyard.
Commander, Puget Sound Naval Shipyard.
Commander, San Francisco Naval Shipyard.

Subj: Radiological Examination of CROSSROADS Target Ships.

Ref. (a) CNO Dispatch 280345Z November.
(b) BuShips 1tr. Serial 1599 of 26 December 1946.

1. Reference (a) designated the Crossroads target vessels to be returned for detailed examination at Naval Shipyards and specified the tentative dates of arrival at the respective yards. Reference (b) outlined the scope of the work required to be undertaken except that no specific instructions were given concerning the radiological examination required. The special radiological examination of the target vessels is designed to exhaust the vessels of all factual data on radiological conditions which may conceivably be of significance. These data shall be segregated suitably and subjected to field analysis, then submitted to the Bureau of Ships for further analysis and dissemination to interested Bureaus and offices. A Bureau of Ships representative will arrange, at the appropriate time, in consultation with the Naval Shipyard San Francisco Radiation Laboratory, the priority of investigations. At that time suitable arrangements will be made for the submission of progress reports.

2. The radiological examination will consist of monitoring the vessels in accordance with the instructions given below. In addition respective shipyards are authorized and directed to remove such samples and lend such assistance as may be requested by special monitors from the Radiation Laboratory at San Francisco Naval Shipyard. In carrying out the examination of the target vessels the special precautions and radiological safety measures prescribed by the Bureau of Medicine and Surgery will be observed.

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3. The Radiation Laboratory at San Francisco Naval Shipyard will conduct the following studies:

(a) In order to facilitate later examination of the ships conduct tests as expeditiously as practicable to determine any respiratory hazard which may be engendered by various operations aboard the ships. The radiological effects of placing the ships ventilation system in operation, where feasible, and of operational activity aboard ships simulate by sweeping various types of contaminated surfaces which exhibit graduated levels of activity should be separately analysed by taking filter samples. The samples may be taken in a manner similar to that used to determine the hazard resulting from sandblasting. In addition it is desired that the adequacy of the type of filter used be investigated by taking check samples behind it using a Navy B-2 gas mask canister as a filter. Similarly, collection should be made of the smoke and fumes resulting from welding and burning on contaminated surfaces at various levels of radiation intensity. Adequate pictorial documentation is requested.

(b) Investigate the effect of varying the orientation of the radiation instruments with respect to the surface being measured. The effect of adjacent large radiating areas on the radiation readings obtained on deck areas is to be checked under the varying conditions found aboard the Target Vessels. The effect of the above factors will be required to evaluate local decontamination measures.

(c) Make a complete and accurate radiation survey of the entire ship as promptly as possible after arrival. This survey is to be made by the specially trained monitors assigned to the Radiation Laboratory. The Roentgen readings for Gamma and Gamma plus Beta radiation should be recorded separately on the ships booklet of general plans. Readings on decks and platforms are to be taken at intervals of five frame spaces from bow to stern and at equivalent intervals from beam to beam. Readings shall be taken on all exterior vertical surfaces at somewhat more frequent intervals. The readings and extent of local areas showing unusually high or low radiation should be defined adequately and located on the same general arrangement plan used above. Interior readings may be spaced at greater intervals in spaces not opened to the weather. However, at all openings such as ventilators, hatches, stacks, and in way of normal access passages readings should be spaced closely.

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Every effort should be made by the use of the proteximeters and by film techniques to obtain an integrated radiation level for all ship control, operating and living spaces aboard. It is desired that representative areas showing the various graduated levels of radioactivity be documented by taking location identifying and detailed close-up photographs of the surfaces. Similar documentation of areas showing unusually high or low radiation levels should also be made.

(d) Collect samples of each type of surface, i.e., wood, painted steel (which may include the several types of paint as separate categories), stainless steel, ceramics, manila, etc. Such samples should be taken for each significant level of radioactivity found and from both vertical and horizontal surfaces. The samples should be documented completely (in place photographs being very desirable) packaged and shipped to the Radiation Laboratory at San Francisco Naval Shipyard. All loose, very highly radioactive material should be gathered up and shipped to the laboratory for possible future use and study. In packaging the samples for shipment, due precautions must be observed to prevent scattering of contaminated material in transit and loss of the contaminants from the samples. The use of the moisture proof overseas type package is recommended. The exterior of the shipping container is to be marked clearly "radioactive material" and should not have a radiation intensity of more than .1R per 24 hours. Where shipment is to be made by commercial carrier, attention of the shipyard must be invited to the existence of regulations for the shipment of radium and/or radioactive materials.

(e) Conduct experimental decontamination of suitably limited topside areas aboard the target ships on each of the various types of surfaces found aboard naval vessels. Such areas are to be chosen after consultation with the Bureau of Ships and the Bureau of Medicine and Surgery representatives. This will of necessity follow the development of a promising method in the laboratory. It may be necessary or desirable to decontaminate radiologically, by a practicable method, certain areas aboard to simplify inspection work.

(f) The laboratory should obtain such additional data and conduct additional studies as deemed feasible or necessary, after approval of the projects by the Bureau of Ships.

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(g) The samples returned to the laboratory at San Francisco are to be used as follows:

(1) Analyse sufficient samples quantitatively and qualitatively to establish the correlation between radiation reading in Roentgens and quantity and quality of radioactive products present on the several surfaces.

(2) Make a detailed and careful study of all the chemical and physical properties of the contaminating materials. The size, shape, distribution, and other properties should be determined with accuracy to provide a standard by which at a future date the contaminating action of a bomb explosion may be duplicated in the laboratory. This is of greatest importance as the veracity of the results of tests of future countermeasures developed will depend in large part upon the rigidity with which the contaminating action of an atomic bomb may be duplicated.

(3) Conduct laboratory radiological decontamination of the various surfaces and materials to develop feasible methods for field application.

(4) Conduct detailed, accurate analyses of all the various ship surfaces, i.e., their porosity, surface phenomena related to absorption, etc. Make such correlation as practicable between such characteristics which appear to be significant and quantity and nature of fission products present, with due cognizance being taken of the effect of aging, leaching and surface deterioration since the Baker Test. Some of the significant factors can be evaluated by comparison with similar analysis of samples on hand which were removed from selected target ships the last week in August. The Bureau of Ships will assemble a log of the weather to which the Targets under study were subjected since Baker Day for use in analysing results.

(5) Conduct such other studies or analyses as are considered feasible or necessary, advising the Bureau of Ships of such action taken.

4. Charges for the shipyard work involved in the above examination may be allocated to project orders as follows:

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